DOCUMENT RESUME

ED 261 225	CE 042 444

TITLE	A Comprehensive Horticulture Curriculum Guide for New Jersey Schools.
INSTITUTION	Rutgers, The State Univ., New Brunswick, N.J. Cook Coll.
SPONS AGENCY	New Jersey State Dept. of Education, Trenton. Div. of Vocational Education.
PUB DATE	85
NOTE	345p.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC14 Plus Postage.
DESCRIPTORS	*Agricultural Education; *Business Administration; Core Curriculum; Floriculture; Greenhouses; Herbicides; *Horticulture; Landscaping; *Nurseries (Horticulture); Ornamental Horticulture; *Plant Growth; Plant Identification; *Plant Pathology; Safety; Secondary Education; Soil Science; State Curriculum Guides; Trees; Turf Management

ABSTRACT

A horticultural core curriculum and draft copies of three horticultural cluster curricula are provided. Materials related to the curriculum development project appear first. The core curriculum is designed to provide broad initial instruction in horticulture for students in the first year of a secondary-level vocational horticulture program. The format for each of the 11 units is as follows: purpose, time requirement, specific objectives, unit outline, suggested activities that are cross-referenced to major sections of the unit outline, evaluation (including suggested method--written and/or performance), and list of references. Units cover career orientation, Future Farmers of America in horticulture, soils, general knowledge of plants, general safety procedures, horticulture hand tools, basic horticultural practices, small engine power in horticulture, identification and control of plant problems, safe application of horticultural chemicals, and horticultural business management. The cluster curricula are: (1) arboriculture; nursery operation and management; turf; and landscape design, establishment, and maintenance; (2) floriculture--floristry and greenhouse operation and management; and (3) olericulture, tree fruits, and small fruits (YLB).

****
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ED261225

A
COMPREHENSIVE HORTICULTURE CURRICULUM GUIDE
FOR
NEW JERSEY SCHOOLS

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Developed By:

Rutgers The State University of New Jersey
Cook College, Department of Education

Funded under P. L. 94-482

In Cooperation with:

The New Jersey Department of Education
Division of Vocational Education

CE042444

ACKNOWLEDGMENTS

Project Personnel

Ms. Sharon Lee Izzi served as editor for the original development of the Core Cluster. Dr. Chester Wichowski served as Curriculum Specialist for the development of the original Core Cluster.

Mrs. Gail K. Sanders, former teacher of horticulture in Minnesota, was selected as part-time Curriculum Development Coordinator.

Curriculum Writers for the Clusters

Mrs. Karen Batista, Union County Vocational-Technical School (on leave); Mr. Anthony Juestrich, Oakcrest High School (also developed 1/2 core); Mr. John Morrow, Phillipsburg High School (also developed 1/2 core).

External Reviewers

Harleigh Kemmerer, Catherine Malison, Edmund Milewski, Robert Parvin, Carroll Shry, and Jan Marie Zafonte.

Field Test Teachers

K. Bania, I. Gavin, R. Griesbach, P. Hilton, V. Kent, P. Kutowski, C. Roszel, N. Semeniuk, B. Soboleski, and L. Warner.

Dr. William G. Smith, Associate Professor of Agricultural Education, Cook College, Rutgers University, served as Project Director on a part-time basis.

Special thanks to Mr. John K. Grover, State Specialist, Agriculture/Agribusiness Education, New Jersey State Department of Education, Division of Vocational Education, whose service as project monitor proved most helpful throughout the project.

*****

85-133-SCDC-503

FINAL REPORT

Horticulture Occupations Curriculum Report

Foreword

NOTE: Implementation of all planned procedures was delayed since grant contract was not received until December 19, 1984.

The Major Objectives of the project that were carried out included:

1. The formative completion of the core section of the comprehensive horticulture curriculum, an external review, field-testing the horticulture core curriculum in school settings, and editing the final copy.

Narrative:

External reviews were conducted by 6 outside experts and provided valuable input for the revision. Several leaders from the Post-Secondary and Associate Degree programs in New Jersey also provided suggestions for improvement of the core curriculum.

Ten New Jersey schools participated in field testing the existing core curriculum units; most schools field tested three units. Overall ratings received were very good, with numerous beneficial suggestions offered. These suggestions were incorporated into the revised curriculum.

2. The completion, at the first draft level of three horticulture cluster curricula:

    1. Aboriculture, Landscaping, Nursery Operation and Turf Management
    2. Floriculture - Floristry and Greenhouse Operation and Management
    3. Olericulture, Small Fruits and Tree Fruits

Narrative:

The services of three outstanding teachers of horticulture were secured in carrying out this phase of the project. Each curriculum writer assumed responsibility for writing one of the draft cluster curricula. Following editing and minor revisions, these clusters were included with the core curriculum to provide for specialized instruction in the three occupational clusters important in New Jersey.

FISCAL YEAR

SCHOOL YEAR

APPLICATION FOR VOCATIONAL EDUCATION FUNDS (P.L. 94-482) SUBPART 3

CAL EDUCATION AGENCY COOK COLLEGE RUTGERS UNIV CO CODE ___ CODE # OF LEA ___ 3

COUNTY MIDDLESEX ADMINISTRATION PHONE (201) AREA CODE 932-94[illegible]5

OJECT
CTOR Dr. William G. Smith SCHOOL ADDRESS P. O. Box 231, New Brunswick, NJ ZIP CODE 08903

Associate Professor TELEPHONE NO. (201) 932-[illegible] DATE SUBMITTED June 6, 1984

DO NOT WRITE IN BOXES (STATE USE ONLY) CO LEA PROG SCDG

	PROJECT TITLE (26)	O E CODE (27)	START DATE	END DATE			FUND	STATE USE		SCHOOL NAME (80)
503										

NOTE: ATTACH A DETAILED BUDGET. BUDGET LINE ITEMS SHOULD INDICATE THE CALCULATIONS USED TO JUSTIFY AMOUNTS OF FUNDS REQUIRED. USE EVEN DOLLARS.

12 SALARY (38)	13 TRAVEL (39)	14 SUPPLIES (40)	15 EQUIP PUR (41)	16 EQUIP RT (42)	18 MISC (44)	19 TOTAL (45)
23,956	750	800			500	26006

PROJECT TITLE Horticultural Occupations

BUDGET

eck ONE Only:

RESEARCH
EXEMPLARY & INNOVATIVE
CURRICULUM DEVELOPMENT
VOCATIONAL GUIDANCE
& COUNSELING
VOCATIONAL EDUCATION
PERSONNEL TRAINING
DISPLACED HOMEMAKER
SEX BIAS SEX ROLE
STEREOTYPING

SALARY $23,956 (List all positions or titles, such as project director, secretary, consultants, etc., state percent of time on the project, per annum salary, pro rated project salary, and beginning and ending ending dates of project employment.)

TRAVEL $800 (Indicate purpose and how estimate was determined for fares and/or mileage [illegible]

SUPPLIES $800.00 (Itemize costs for project materials and supplies.)

EQUIPMENT PURCHASE (Indicate type and rental price of equipment

EQUIPMENT RENTAL (Indicate duration and rate. Only instructional equipment is eligible for rental.

MISCELLANEOUS
Communications $500 (Telephone, postage, etc.)
Service (Itemize duplication and reproduction, statistical testing and other services.)
Other (Specify)

I hereby certify that the information contained in this application is to the best of knowledge correct, and the [illegible] above has [illegible] application.

Number of Major Priorities Ans...

A ___ or B ___

Date

Signature - Chief Administrative Officer

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503 - 133 - SCDG

43

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IDENTIFICATION NO.__________ AMOUNT FUNDED__________

FUNDED UNDER SECTION __________ OF P. L. 94-482

PROJECT TITLE: Horticultural Occupations Curriculum

LEGAL NAME OF APPLICANT DISTRICT, INSTITUTION OR AGENCY: Cook College, Rutgers University-The State University

ADDRESS: P. O. Box 231
New Brunswick , NJ ZIP CODE: 08903

PROJECT DIRECTOR: Dr. William G. Smith

TELEPHONE NUMBER: (201)932-9164
(Area Code)

ABSTRACT

DESCRIPTION OF PROJECT

(Use this sheet and no more than one other to type in single-spaced form a statemen of project objectives, procedures to be followed, state and local priorities emphasized and the expected contribution of the project to vocational education.)

The project will complete the second and third phases of a curriculum development project undertaken in 1982 at the New Jersey Vocational-Technical Curriculum Laboratory. Major activities will include (a) field-testing the horticulture core curriculum already developed in a school setting, edit, revise and print and (b) compile and develop at the first draft level, three horticulture cluster curricula:

#1 Aboriculture-Landscaping-Nursery Operation and Management-Turf
#2 Floriculture-Floristry-Greenhouse Operation and Management
#3 Olericulture-Small Fruits-Tree Fruits and,

(c) printing and dissemination 100 copies of the above curricular materials to appropriate schools in New Jersey.

The product of this effort will have a positive impact on the vocational horticulture education programs in New Jersey by providing competency-based curricular materials for basic core and occupationally clustered instruction.

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HORTICULTURAL OCCUPATIONS

PROBLEM

During the 1982 project year the development of a comprehensive horticulture curriculum was undertaken. At this time, it was decided by the project advisory committee to organize this curriculum with a central core of common competencies and three related clusters of specialized competencies. A research base for this decision was provided from the findings of a national survey effort conducted in order to analyze the worker competencies in all areas of agriculture*. Peripheral to the central core were the following three clusters: Cluster I, Arboriculture, Landscaping, Nursery and Turf: Cluster II, Floriculture, Florestry and Greenhouse; and Cluster III, Olericulture, Small Fruits and Tree Fruits. An outline of the content included in the core as well as the three clusters is included in the Product Description Section of this proposal.

Due to the unexpected complexity of the organizational structure of curriculum as it was determined during the formative period of this activity, the remaining time available in the fiscal year, and the reorganization/relocation of the N.J. Vocational-Technical Curriculum Laboratory the central core of the curriculum was the only section completed. Continued efforts are therefore necessary to: (1) complete the formative development of the central-core section of the curriculum to include an external review for content validity and structure, (2) field-testing in a school setting and (3) write, at a first draft level of completion, three horticulture clusters as an activity concurrent to the review and field testing of the central-core.

Significance to Vocational Education

As was determined through the needs assessment, which provided a supportive data base for the initialization of this curriculum development effort, very few comprehensive horticulture programs were identified to exist in this state. Dominant throughout N.J. was the area of ornamental horticulture, a sub-section of comprehensive horticulture.

The continued development of the comprehensive horticulture curriculum will therefore contribute to the possible modification/or expansion of existing ornamental horticulture programs. To be gained through the operational use of such a curriculum would be: (1) an increase in the number of possible sub-areas of horticulture offered, (2) an expansion of the number of choices for specialization in the area of horticulture available to students, (3) an expanded labor-market potential of program graduates, and (4) the basis of an in-service guide for the teacher who may not have a background in the various sub-areas of the entire field of horticulture.

CURRICULUM RESEARCH

Research activities were conducted during the 1981-82 academic year through the application of a needs assessment model to the program areas of agricultural education, home economics education and marketing and distributive education. This model includes five sequential parts and involved the collection of data from selected state and federal data bases. As applied during the 1981-82 academic year, these parts included the following elements:

---

* McClay, David, The National Agriculture Occupation's Competency Study, Washington D.C.: U.S. Government Printing Office, 1978.

Part I: Decision-Making Factors

Following discussion by members of project advisory committee, a survey instrument including seven factors associated with the allocation of vocational education resources was developed. The mean weighted assignments given to these factors by a population of County Career Education Coordinating Council members in New Jersey (N=122) is included in Table 1.

Table 1

Weight Assignments Given to Decision-Making Factors

Decision-Making Factors	Mean (Weights)
Job Market Demand	28.85
Enrollment	20.81
Placement Figures	17.59
Typical Job Earnings	10.71
No. of Disadvantaged Enrolled	8.65
No. of Handicapped Enrolled	8.63
No. of Limited English-Proficient Enrolled	4.82

Part II: A Program Title Survey

Due to the limited number of vocational titles in the VEDS system for the program areas of agricultural education, no additional program title survey activities were undertaken. The subject titles which were reviewed in the needs assessment for agriculture are listed in Table 2.

Part III. Demographic Importance

This part of the model involved the collection and subsequent application of selected data from state and federal sources to calculate demographic importance scores for the vocational education program specific titles reviewed. The sex weighted decision-making factors were mathematically applied to this data. In outline form, the first three parts of the model were applied in the following manner in order to calculate the demographic importance scores:

1. Identify decision-making factors and determine their weighted values.*

   $(W_1,W_2,W_3,W_4,W_5,W_6,W_7)$*
2. Collect raw community and school based demographic data for each program specific title.
3. Normalize the demographic data within each vocational education program area by dividing the largest number into the remaining numbers in each decision-making factor category. The resulting normalized data will have a range from 1.00 to 0.00.

   $(A_1,A_2,A_3,A_4,A_5,A_6,A_7)$
4. Calculate the Demographic Importance Scores (DIS) for each program specific title by multiplying the normalized data by the weighted value and summing across.

$$DIS = (w_1\ A_1) + (W_2\ A_2) + (W_2\ A_3) + W_4\ A_4) + (W_5\ A_5) + (W_6\ A_6) + W_7\ A_7)$$

---

* Decision-Making factor weights that were determined in PartI this needs assessment.

Part IV: Educational Need

The fourth part served to review selected curriculum materials in use throughout the state using a set of fifteen standards reflecting the generic elements of competency-based vocational education as well as considerations appropriate to special student populations through the use of a curriculum rating schedule developed specifically for this activity. A copy of this rating schedule is included on the following page. Curriculum materials consisting of courses of study, lesson plans, course texts and instructional supplements are reviewed by research team members during on-site visitations. Data collected are converted to discrepancy scores by subtracting actual ratings from maximum rating values (4.0) and then averaging these in order to calculate educational need scores.

The demographic importance scores developed in the third part of the procedure were subsequently interfaced with the educational needs scores from the fourth part of the procedure in order to facilitate the development of ranking ordering listing of vocational education program titles with the highest calculated statewide need.

The results of these calculations are included in Table 2.

Part V: A Decision-Assisting Review

A rank ordered listing of findings based on calculated statewide need in a particular program area served as a vehicle to initiate the final part of the model, an executive level decision-assisting review. Following the collection of all data necessary, rank order listings were developed in the agricultural education program area. Following discussion with the appropriate state level supervisor , the subject title of comprehensive horticulture was identified for future development in the agriculture education program area. It should be noted that this title was not included in the VEDS system but is included in the NCES system. The NCES system is projected to replace the VEDS system in 1984. Further, it was determined through discussion during the final stage of the needs assessment that development in the area of comprehensive horticulture rather than the more focused area of ornamental horticulture would in fact be more appropriate to the agricultural education needs of N.J. and the Northeastern Region of the United States.

DESCRIPTION

The three clusters of the comprehensive horticulture curriculum will follow the same format used in the central core. This includes a statement of purpose, specific objectives, a unit outline, suggested activities, an evaluation sheet and a reference section. Each of these content elements are described below:

1. Purpose. This element precedes each section to provide the user with a brief description of the content and the purpose of the unit.
2. Specific Objectives. These are measurable enabling objectives of unit purpose. Student mastery of all specific objectives is necessary to the achievement of the unit purpose. The number of specific objectives varies with each unit of instruction.
3. Unit Outline. This is designed to give the instructor a more detailed breakdown of the content of each unit as well as a sequencing for presentation of material.

4. Suggested Activities. Include on this sheet are listings of suggested instructional activities. These have been included as an aid to the instructor to guide the student in the achievement of the specific objectives.
5. Evaluation Sheet. This is designed to give the instructor and the student a means of plotting progress. The actual measure of evaluation is to be developed by the instructor.
6. Reference Section. This provides a listing of books, films, filmstrips, and other publications which will supplement the individual units.

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Table 2
COMPUTATIONAL DATA BASE FOR PROGRAMS REVIEWED IN AGRICULTURAL EDUCATION

M SPECIFIC TITLE	OE/VEDS Code No.	RAW DATA JMD	ENROLL	PLACE	WAGE	DIS	HAND	LIM-ENG				
Production	010100	136	207	--	--	53	6	1				
Supplies/ vices	010200	244	64	--	--	15	13	0				
Mechanics	010300	23	57	--	--	4	3	9				
Products	010400	109	14	--	--	9	1	1				
ntal Hort.	010500	590	538	--	--	178	126	4				
Resources	010600	2	55	--	--	11	3	4				
ry	010700	105	1	--	--	0	0	0				
Agric.	019900	105	82	--	--	28	11	0				
		NORMALIZED DATA W(28.85)	W(20.81)	--	W(10.71)	W(8.65)	W(8.63)	W(4.82)	Demographic Importance Score	Educ. Need Score	Total	Rank
Production	010100	.23	.385	--	--	.30	.048	.11	18.17	1.65	29.98	3
Supplies/ ices	010200	.38	.119	--	--	.08	.103	0	15.06	1.48	22.29	4
chanics	010300	.039	.106	--	--	.022	.024	1.0	8.55	1.42	12.15	[illegible]
Products	010400	.185	.026	--	--	.05	.008	.11	20.38	2.02	41.17	2
tal Hort.	010500	1.0	1.0	--	--	1.0	1.8	.44	69.08	1.18	81.5[illegible]	1
Resources	010600	.003	.102	--	--	.062	.024	.44	5.01	1.68	8.42	7
	010700	.178	.0019	--	--	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
gric.	019900	.178	.15[illegible]	--	-	.1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5

CURRICULUM RATING SCHEDULE
New Jersey Statewide Curriculum Development Project

Program Title______________________________ VEDS No.______Level of Delivery S___PS___

NUMERICAL VALUE

1	2	3	4
0 - 20%	21 - 50%	51 - 80%	81 - 100%

PERCENTAGE OF CHARACTERISTIC

____1. The materials contain objectives which include conditions, performances and criteria

____2. The materials contain a system for evaluating students' performances, including test and/or performance checklist that directly measure mastery of the objectives.

____3. The content covered in the materials is current and includes all the necessary knowledge, skills and attitudes.

____4. The materials are free of sex bias.

____5. The materials are accompanied by adequate instructor management information such as record-keeping forms, course sequencing, and directions for implementation.

____6. The materials are structured well enough and provide enough student directions to facilitate open-entry/open-exit, self-pacing and individualization.

____7. The materials are organized to permit a progression of employable skill development throughout the entire program.

____8. The materials are designed to facilitate integral record-keeping in relation to the Individualized Educational Program (IEP).

____9. The materials contain a system for continuous formative evaluation that facilitates communication with the I.E.P. Team.

___10. The materials contain prerequisite levels of cognitive, psychomotor, affective and perceptual skills necessary for successful entry into each instructional unit.

___11. The materials provide for prescriptive teaching techniques, alternative instructional materials, and individualized student learning activities that lend themselves to disparate learning styles.

___12. The materials have been field-tested with normal populations.

___13. The materials have been field-tested with handicapped populations.

___14. The materials have been field-tested with disadvantaged populations.

___15. The materials have been field-tested with gifted populations.

Primary Text:____
(Author) (Title) (Copyright)

Origin of Curriculum Materials:____
(date of origin - rev

COMMENTS:

OBJECTIVES

The objectives to be completed through this project include:

1. The formative completion of the core section of the comprehensive horticulture curriculum.

    a. An external review for content validity and structure.
    b. Field testing of the materials in schools.
    c. Editorial adjustments as necessary.

2. The completion of the three horticultural clusters at the first draft level.

    a. Cluster 1. Arboriculture, Landscaping, Nursery and Turf.
    b. Cluster 2. Floriculture, Floristry, and Greenhouse.
    c. Cluster 3. Olericulture, Small Gruits and Tree Fruits.

PROCEDURES

The procedures to be followed in order to achieve the objectives of this proposal are listed in the following outline:

OBJECTIVE 1: The completion of the core section of the Comprehensive Horticulture Curriculum.

Activity	Time Line
1. Develop instrumentation for data collection. a. External review b. Field testing	Summer 1984
2. Contract reviewers and conduct external review.	Summer 1984
3. Contact and meet with field test teachers. a. Provide orientation b. Identify responsibilities c. Explain procedures to be followed	October 1984
4. Edit materials as needed	Sept./October 1984
5. Print materials for field testing	November 1984
6. Collect feedback data	December 1984 - April 1985
7. Edit material as needed.	May 1985

OBJECTIVE 2 The completion of the three horticultural clusters at the first draft level.

Activity	Time Line
1. Meet with advisory committee a. Identify curriculum writers and editor b. Establish time line for the completion of material.	September 1984
2. Meet with writers and editor. a. Conduct orientation b. delineate responsibilities c. Establish operating schedule	October 1984
3. Revise and edit materials as needed	November 1984- May 1985
4. Develop cover, introduction and suggestions for use for curriculum materials.	January 1985
5. Conduct external review of materials.	May-June 1985
6. Conduct an external review of materials for content validity and structure.	May-June 1985
7. Edit materials as needed.	May-June 1985
8. Arrange for dissemination of materials.	May-June 1985

EVALUATION

Evaluation of this curriculum will be achieved during its formative development by an external review for content validity by teachers and representatives from the production area as well as the support industries of the comprehensive areas of horticulture. Additional evaluation will occur during field testing in schools identified which are representative of the educational delivering systems providing instruction in the various sub-areas of horticulture in New Jersey.

All persons identified for the external review for content and structure as well as the field test locations will be determined through recommendations provided by the advisory committee. Instrumentation for data collection are currently in the process of development.

DISSEMINATION

The dissemination of the curriculum materials developed through the objectives of this proposal will be achieved through the Department of Education, Cook College, Rutgers-The State University of New Jersey.

PERSONNEL

The following personnel have been identified to complete the objectives of this curriculum project: (1) a part-time project director, (2) a part-time curriculum development coordinator, (3) a part-time secretary (4) three curriculum writers, (5) six external reviewers and (7) approximately 10 field test teachers.

In addition to the above listed personnel, this project will be aided by an advisory committee. A listing of advisory committee members which was established during the first year of curriculum development will be supplied as soon as confirmed.

REDUCTION OF SEX ROLE STEREOTYPING

All curriculum materials developed as a result of this proposal will be done in order to aid the reduction of sex role stereotyping. Action will be taken to eliminate language usage and illustrations which foster sex role stereotyping as it might relate to curriculum materials produced. The Office for Equal Access in Vocational Education, the New Jersey State Department of Education, Division of Vocational Education will be consulted as necessary to achieve this goal. Further, the staffing of this project will be open to all persons regardless of their sex, religion, cultural or ethnic background.

INSTITUTIONAL CAPABILITY AND COMMITTMENT

The Department of Education, Cook College, Rutgers University supplemented with additional specialized staff and services is capable of providing the institutional support necessary for the completion of this curriculum project. Statements of assurances have been attached to this proposal.

HORTICULTURAL OCCUPATIONS BUDGET

SALARIES			
Project Director, 1 month salary	$2705.	$2705.	
Curriculum Development Coordinator Graduate student or one-half time instructor for academic year	8361		
fringe @ 24%	2007		
		10,368.	
Clerical Compilation, revisions, data analysis, typing, one-half time for academic year	4663		
	1120		
		5783.	
Honoraria			
Consultants - External Reviewers 6 X $100		600.	
Curriculum Writers, 3 @ $1000		3000.	
Field test teachers, 10 @ $150		1500.	
			$23,956
Reproduction, 100 copies of			
Final copy, core curriculum @ $5.00 per		500.	
Draft copy, 3 cluster curricula @ $1 ea. X 3		300.	
			800
Miscellaneous			
Postage		300.	
Telephone		200.	
			500
Travel			
5 visits per 10 field test sites = 50X50 mi. per		500.	
other project related travel (director & Coordinator)		250.	
			750
		TOTAL	$26,006

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THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS

LOG NUMBER (for office use only)

ABSTRACT OF PROPOSED PROJECT

NAME	Dr. William G. Smith	AFFILIATION/CAMPUS ADDRESS	Cook College, Waller Hall
CAMPUS TELEPHONE	9164	AGENCY OR ORGANIZATION TO WHICH PROPOSAL IS SUBMITTED	N.J. State Dept. of Education Division of Vocational Educ.

TITLE OF PROJECT Horticultural Occupations Curriculum

Please provide an abstract of the proposed project in the space below, in terms understandable to an intelligent lay audience. If the project is funded, this abstract will become a public document. Therefore, do not include any data or materials potentially subject to copyright or patent protection, proprietary information from the sponsor, or budgetary or personal data. Please limit your abstract to ONE PAGE and underline KEY WORDS which help identify the project.

The project will complete the second and third phases of a curriculum development project undertaken in 1982 at the New Jersey Vocational-Technical Curriculum Laboratory. Major activities will include (a) field testing the horticulture core curriculum already developed in a school setting, edit, revise and print and (b) compile and develop at the first draft level, three horticulture cluster curricula:

#1 Aboriculture-Landscaping-Nursery Operation and Management-Turf
#2 Floriculture-Floristry-Greenhouse Operation and Management
#3 Olericulture-Samll Fruits-Tree Fruits and

(c) printing and dissemination 100 copies of the above curricular materials to appropriate schools in New Jersey.

The product of this effort will have a positive impact on the vocational horticulture education programs in New Jersey by providing competency-based curricular materials for basic core and occupationally clustered instruction.

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DIVISION OF VOCATIONAL EDUCATION
OFFICE OF THE ASSISTANT COMMISSIONER

JUN 12 1984

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CLUSTER CURRICULA		Color Code
I	ARBORICULTURE	Green
	NURSERY OPERATION & MANAGEMENT	
	LANDSCAPE DESIGN, ESTABLISHMENT AND MAINTENANCE	
	TURF	
II	FLORICULTURE: FLORISTRY AND GREENHOUSE OPERATION AND MANAGEMENT	Pink
III	OLERICULTURE, TREE FRUITS, SMALL FRUITS	Yellow

INTRODUCTION

NEW JERSEY COMPREHENSIVE HORTICULTURE CURRICULUM PROJECT

The original Comprehensive Horticulture Curriculum Project was begun in 1982-83 as a New Jersey Curriculum Laboratory activity funded by the New Jersey State Department of Education, Division of Vocational Education. The Cook College, Rutgers University, Department of Education submitted a proposal in 1984 to complete other phases of the project.

The results of these efforts are provided for your consideration and use:

I. A Horticultural Core Curriculum that has been developed around common core competencies* important in most occupational areas of horticulture and field tested in New Jersey;

II. Draft copies of three Horticultural Cluster Curricula:

   A. Arboriculture, Landscaping, Nursery and Turf
   B. Floriculture - Floristry and Greenhouse Management
   C. Olericulture, Small Fruits and Tree Fruits

These materials should be considered as schools seek to initiate, update, and improve the horticultural curricula in their programs. They represent the hard work and best thinking of curriculum writers, external reviewers, and field test teachers. There is the potential to improve the scope and quality of horticultural instruction in New Jersey.

Dr. William Smith
Curriculum Project Director
June, 1985

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*National Agriculture Occupations Competency Study, McClay, David R., 1978, U.S.O.E., Washington, DC.

Format of the Curriculum

Overview:

The PURPOSE section at the beginning of each unit in the core and cluster curricula provides a general educational goal statement for the contents of the unit. This statement is followed by a number of SPECIFIC OBJECTIVES for the unit. These objectives are closely related to the Area(s) of Evaluation section at the end of each unit. The UNIT OUTLINE lists major, minor, and sub-topics germane to the unit goals and objectives in a suggested sequence.

The SUGGESTED ACTIVITIES at the end of the UNIT OUTLINE provide educational activities that are designed to enhance learning and are cross-referenced ( ) to major sections of the UNIT OUTLINE. An EVALUATION section follows with numbers of Areas of Evaluation and Suggested Method - Written and/or Performance. The Areas of Evaluation are cross-referenced to sections of the UNIT OUTLINE. A list of REFERENCES concludes each unit.

Suggested Guidelines for Implementation:

The core curriculum is designed to provide the broad initial instruction in horticulture for students in the first year of a secondary level vocational horticulture program. It is suggested that teachers preview each unit in the core and cluster curricula to determine appropriateness to their local situation, facilities and equipment. SUGGESTED ACTIVITIES provided at the end of each unit are particularly significant in localizing the curriculum materials.

While much information is supplied in outline form in each unit, supplementing with the most current recommendations will be necessary. Additional References will also be helpful. It will be noted that there is cross-referencing between SUGGESTED ACTIVITIES in the core and the sections of the core providing for integration of instruction. Also, sub-unit topics in the Cluster Curricula are cross-referenced to basic units in the core to provide for coordination and review.

Particular attention should be paid to the EVALUATION section at the end of each unit. A number of Areas of Evaluation are listed and cross-referenced to unit ( ) with Suggested Method of evaluation, Written and/or Performance. An attempt should be made to increase the number of performance-type evaluation methods by maximizing utilization of the local situation. There is also a tie-in of the Evaluation Area and the SPECIFIC OBJECTIVES for each unit. It is suggested that the Areas of Evaluation could form the basis for a student competency check list and/or progress chart for each unit.

Horticulture Core Section

The outline of units contained in this section are presented in one suggested sequence. Each unit is designed to be self-contained so teachers have the freedom to present the units in any logical sequence that best fits the needs of their students. It is suggested that Unit 7, "Basic Horticulture Practices" may be utilized as a framework for the laboratory instruction throughout the first year in the horticulture program: in this manner "hands on" experiences may take place continually instead of grouped together at one point during the year. This method also serves to motivate the students on a continuing basis through the year.

It is not anticipated that every unit will be used by all instructors or that every portion of a unit will be emphasized to the same degree. In addition to the background the students bring with them, the economic aspects of the enterprises in the local community, the available facilities and the instructional hours available will determine the extent to which the outline is followed.

The core curriculum provides sufficient science-based subject matter to merit local consideration as meeting a science requirement. All units of the core curricula are flexible in that they will require considerable additional instructional material to implement.

Draft Cluster Curricula Sections

Each of the draft cluster curricula address an occupational cluster in the field of horticulture. As the core curriculum provides occupational competencies common to most horticultural jobs, the cluster curricula have been developed to provide occupational competencies common to jobs within each cluster.

The overriding goal of this project is to provide a basis for a comprehensive curriculum in horticulture for New Jersey secondary schools. The complete sequence of the core and the three clusters is designed to provide a more comprehensive horticulture curriculum than presently offered in many New Jersey schools. Local school districts, teachers, and their advisory committees will of course determine whether this sequence or some modification is appropriate to meet local needs. Sample scheduling formats follow.

Sequence and
Suggested Time Allocation
for Core Units

	Unit Title	Estimated Time Required (wks)
1.	Career Orientation	1 - 2
2.	FFA in Horticulture	2
3.	Soils	3 - 4
4.	General Knowledge of Plants	4 - 5
5.	General Safety Procedures	2
6.	Horticulture Hand Tools	2
7.	Basic Horticulture Practices	4 - 5
8.	Small Engine Power in Horticulture	4 - 5
9.	Identification and Control of Plant Problems	3
10.	Safe Application of Horticultural Chemicals	3
11.	Horticultural Business Management	2 - 3
		36

Note: For each unit SUGGESTED ACTIVITIES, at the end of each unit are cross referenced to sections of the Unit Outline.

Suggested Comprehensive Sequence
Four-Year Program

Grade	
9th	Core Curriculum
10th	Floriculture - Floristry, Greenhouse Management
11th	Arboriculture, Landscaping, Nursery and Turf
12th	Olericulture, Small Fruits, Tree Fruits

Suggested Modified Sequence - Two to Four-Year Program

Grade	
9th	
or	Core Curriculum
10th	
and/or	Floriculture - Floristry, Greenhouse Management
11th	and/or
and/or	Arboriculture, Landscaping, Nursery and Turf
12th	and/or
	Olericulture, Small Fruits, Tree Fruits

INTEGRATING FFA, SOE, AND OCCUPATIONAL GUIDANCE

Participation in the Future Farmers of America student organization activities, Supervised Occupational Experience programs and occupational guidance are integral components of a complete program of vocational education in agriculture or horticulture. The motivational and educational aspects of these components have proven essential for high quality programs.

FFA

A conscious effort has been made to integrate FFA in this curriculum guide. With the current popularity of horticultural programs in the state (and nation) a wide variety of appropriate FFA activities have been developed for horticultural students. For example, ten of the fifteen (15) competitive judging events sponsored by the New Jersey Association of FFA deal with horticultural topics. The National FFA organization also sponsors numerous activities of a horticultural nature. Note: Please refer to the N.J. State FFA Activity Guide and the National FFA Chapter Resource System for detailed information.

SOE

Throughout this curriculum guide, reference is made to Supervised Occupational Experience, particularly under SUGGESTED ACTIVITIES. The integration of competency-based instruction is greatly enhanced by developing strong SOE programs for all students. Basic occupational attitudes, knowledges, and skills learned in the school classroom and laboratory will be further developed in the real world through meaningful student SOE programs. These programs provide students with opportunities to develop proficiencies as well as specialized competencies in their chosen occupational area.
Note: Please refer to the current Guidelines for Supervised Occupational Experience Programs, STED.

Occupational Guidance

Students enrolled in vocational programs require current and accurate information concerning career opportunities in choosing and pursuing their field of preparation. Teachers of horticulture are in a knowledgable position concerning student needs and abilities, the related opportunities and requirements of the field, thus have a key role in occupational guidance.

Career orientation content is evident in the core and cluster sections of this curriculum guide. Adequate information must be provided to enable students to make sound career goal choices. It is suggested that all available resources, including: guidance personnel, advisory committee members, guest speakers, computer information systems, etc., be utilized to provide the very best information available. It should be noted that numerous opportunities for post-secondary through advanced degree education in horticulture, including four county college programs and Cook College in New Jersey, are available to students seeking higher education.

HORTICULTURE CORE ELEMENTS

UNIT 1

CAREER ORIENTATION

PURPOSE:

The purpose of this unit is to provide the student with the information and learning activities necessary to develop a basic knowledge of agricultural occupations including scope, educational requirements, skill competencies and working conditions. Students should relate career information to their community situation and to the selection of a supervised occupational experience project as well as development of an employment goal in agriculture.

Time Required : 1-2 weeks

SPECIFIC OBJECTIVES:

After completion of this unit, students will be able to :

1. Define agriculture and horticulture.
2. Identify the agricultural occupations of the community.
3. Explain the agriculture chain of command.
4. List the agriculture career headings and cite examples of each.
5. Examine the employment requirements and skill competencies for specific horticultural occupations.
6. Develop a personal plan for acquiring the competencies and meeting the requirements for job entry in a specific career.
7. Seek and secure employment in Production Horticulture, Agribusiness, or Natural Resources. Record a log of related experiences.
8. Select and develop plans for a supervised occupational experience project in Horticulture.

UNIT OUTLINE:

I. Agriculture Defined.
    A. Previous Concept, Exclusively Farming.
    B. Latest Concept, Include Related Careers.

UNIT OUTLINE (continued)

II. Community Agriculture Reviewed.

- A. Farming.
- B. Related Agricultural Businesses.
    1. Professional and non-professional.
    2. Skill requirements.

III. Agricultural Chain of Command and Other Related Information.

- A. U.S. Secretary of Agriculture.
- B. U.S. Secretary of Interior.
- C. State Secretary of Agriculture.
- D. Agricultural Education Personnel.
- E. National and State FFA Personnel.
- F. Local Extension Service Personnel.
- G. Local Conservationists and Foresters.
- H. Local Important Agricultural Offices and Service Units.

IV. The Agricultural Career Headings and Examples.

- A. Research
    1. Production.
    2. Processing.
    3. By-products.
    4. New uses and methods.
    5. New products.
    6. Marketing.
    7. Economics.
    8. Agricultural engineering.
    9. Equipment and utilities.
    10. Conservation.
    11. Reclamation.
    12. Rural sociology.

UNIT OUTLINE (continued)

B. Industry.

   1. Machinery and equipment.
   2. Food processing.
   3. Grain and seed processing.
   4. Meat and poultry packing.
   5. Fertilizer and lime.
   6. Pesticides and herbicides.
   7. Feed manufacturing.
   8. Dairy processing.
   9. Fats and oils.
   10. Textiles and fibers.
   11. Buildings and utilities.
   12. Forest products.

C. Business.

   1. Banking and credit.
   2. Insurance.
   3. Farm management.
   4. Cooperative management.
   5. Land appraisal.
   6. Grading, packaging, and labeling.
   7. Marketing.
   8. Storage and warehousing.
   9. Transportation.
   10. Farm utilities.
   11. Custom services.
   12. Private business.

D. Farming and Ranching.

   1. General.
   2. Grain.
   3. Beef.
   4. Dairy.
   5. Horses.
   7. Sheep.
   8. Swine.
   9. Cotton.
   10. Forage.
   11. Tobacco.
   13. Vegetables.
   14. Seed production.
   15. Nursery & greenhouse.
   16. Specialty.

E. Services. Landscaping, Arboriata, etc.

   1. Inspection and regulation.
   2. Quality control and grading.
   3. Organizations and foundations.
   4. Agricultural consultants.

UNIT OUTLINE (continued)

E. Services. (continued)

  5. Agricultural statisticians.
  6. Agricultural technicians.
  7. Veterinarians.
  8. Foreign agricultural service.

F. Education.

  1. Vocational agriculture.
  2. Agricultural extension.
  3. College instruction.
  4. Governmental agencies.
  5. Farm organizations.
  6. Industrial agencies.
  7. Business firms.
  8. International technical aid.

G. Communications.

  1. Farm reporting.
  2. Newspapers.
  3. Market reporting.
  4. Publications.
  5. Magazines.
  6. Photography.
  7. Advertising.
  8. Exhibiting.
  9. Radio.
  10. Recording
  11. Television.
  12. Motion pictures.

H. Conservation.

  1. Soil.
  2. Water.
  3. Range.
  4. Forest.
  5. Fish.
  6. Wildlife.
  7. Parks.

I. Recreation.

  1. Camp grounds
  2. Golf courses.
  3. Parks.

UNIT OUTLINE (continued)

V. Study Selected Agricultural Occupations.

   A. Determine Personal Interests.

   B. Assess the Competencies that are Needed for Job Entry.

   C. Determine Educational Requirements.

   D. Assess Personal Traits Needed for an Occupation.

   E. Consider Federal Requirements which Apply to Various Occupations.

SUGGESTED ACTIVITIES: (Cross references are made to sections of the Unit Outline.)

1. Show overhead transparency on pictorial definition of agriculture. (I)
2. Show slide presentation on local horticulture. (II)
3. Field trips to local horticultural and related enterprises. (II, V)
4. Have the class and FFA sponsor guest speakers within the community who are involved in horticulture. (II, III, V)
5. Show overhead transparency on careers in horticulture. (III)
6. Have students review newspaper and magazine articles dealing with horticulture. (IV, V)
7. Visit production and employment projects of vocational horticulture students.
8. Have students become familiar with and initiate SOE project record books. (VI)
9. Develop chapter cooperative projects such as propagating ornamentals and tree seedling production.
10. Develop FFA community projects such as conserving natural resources and landscaping. (V, VI)
11. Have each student conduct a work experience project, maintaining and evaluating records of the project. (V, VI)
12. Establish and maintain a career library. (I - VI)

EVALUATION - UNIT I

		Suggested Method	
	Area of Evaluation	**Written**	**Performance**
1.	Define Agriculture. (I)	X	
2.	Identify Agricultural Occupations of the Community. (II)	X	
3.	Explain the Agricultural Chain of Command. (III)	X	
4.	List Agricultural Career Headings and Cite Examples of Each. (IV)	X	
5.	Examine Employment Requirements and Skill Competencies for Specific Occupations. (V)	X	
6.	Develop a Personal Plan for Acquiring the Competencies and Meeting the Requirements for Job Entry into a Specific Career. (V)	X	
7.	Seek and Secure Employment in One of the Following Areas and Record a Log. (IV)		X
	a. Production agriculture. (IV)		X
	b. Agribusiness. (IV)		X
	c. Natural resources. (IV)		X
8.	Have Students Report on an Occupation of Their Choice.	X	
9.	Have Students Role Play Various Occupational Roles.		
10.	Evaluate Progress on the SOE Project.		X

(Cross references are made to sections of the Unit Outline.)

REFERENCES:

TEXTS

Horticulture for Profit and Pleasure, text, Chapter I.
J. M. Dent & Sons (Canada) Limited, Ontario, Canada

Hoover, Norman K. Handbook of Agricultural Occupations. Danville, IL: Interstate Printers and Publishers, Inc.

PERIODICALS to consider - listed by title only:

American Nurseryman
American Forests
Florists Review
Grounds Maintenance
National Wildlife
Trade
Vegetable and Fruit Growers

AUDIO VISUALS

Agricultural Education. Transparencies, DCA Educational Products, Inc., Philadelphia, PA. 19144.

Careers in Agriculture. 8 color filmstrips, audio cassettes and illustrated scripts, Vocational Education Productions, California Polytechnic State University, San Luis, Obispo, CA. 93407.

Modern Talking Picture Service, Venard Films. 5000 Park Street North, St. Petersburg, FL. 33709.

New Jersey, The Garden State. Filmstrip and cassette. Public Service Electric and Gas Company. 80 Park Place, Newark, N.J. 07101.

What is Horticulture? 40 slides, $7.60.
Ohio Agricultural Education, Curriculum Materials Service, Ohio State University, Room 254, 2120 Fyffe Rd., Columbus, OH. 43210.

OTHER

Resident Instruction Committee on Organization and Policy, Colleges of Agriculture and Natural Resources, the National Association of State University and Land Grant Colleges. Office of Resident Instruction, Cook College, Rutgers University, New Brunswick, N.J. 08903.

Introduction to Horticulture - Ornamental Horticulture for Pre-employment Laboratory Training in Agriculture
Texas Educational Agency and Texas A. & M. University, Section I, pgs. 1-7.

Ornamental Horticulture Technology - A curriculum guide for High School Education.

The Garden Center Worker, manual, 140 pgs.
Ohio Agricultural Education, Curriculum Material Service, Ohio State University, Room 254, 2120 Fyffe Rd., Columbus, OH. 43210.

REFERENCES (continued)

OTHER

Exploring Turfgrass Occupations, 30 slides, $5.00
Ohio Agricultural Education, Curriculum Material Service,
Ohio State University, Room 254, 2120 Fyffe Rd., Columbus, OH. 43210.

Horticulture Service Occupations, course outline, 22 pgs.
Ohio Agricultural Education, Curriculum Material Service,
Ohio State University, Room 254, 2120 Fyffe Rd., Columbus, OH. 43210.

N.J. Manpower Needs in Natural Resources and/or Agriculture
Rutgers University, New Brunswick, N.J. 08903.

Looking for a Rewarding Future
Rutgers University, New Brunswick, N.J. 08903

Agricultural Cooperative Training in Vocational Agriculture, manual
Texas A. & M.

Horticulturist, book and cassette
EMC Publications, 300 York Avenue,
St. Paul, MN. 55101.

Challenging Careers in Soil Conservation
Soil Conservation Service,
USDA, Washington, D. C.

HORTICULTURE
OCCUPATIONAL TITLES

Production Oriented Occupations

Greenhouse Worker
Nursery Worker
Nursery Owner
Vegetable Producer
Greenhouse Worker
Christmas Tree Producer
Turf Producer
Tree Farmer
Greenhouse Owner
Flower Production Employer
Bedder
Vegetable Grower Employee
Fruit Producer
Mushroom Grower
Nursery Employee
Wholesale Flower Producer

Technical Oriented Occupations

Groundskeeper
Agronomist
Equipment Mechanic
Plant Propagator
Lawn Specialist
Tree Surgeon
Tree Sprayer
Tree Pruner
Landscape Architect
Arborist
Pest Control Technician
Inspector
Research
Extension Specialist
Landscape Designer
Landscape Consultant
Plant Breeder
Lab Technician

Sales and Service Occupations

Flower Shop Worker
Florist
Garden Center Manager
Horticultural Products Sales Person
Vegetable Market Manager
Fruit Market Manager
Fruit Market Employee
Floral Arrangement Specialist
Produce Dept. Manager - Grocery Store
Deliveryman
Garden Center Employee

Related Occupations

Landscaping Assistant
Landscape Gardener
Athletic Field Groundskeeper
Teaching (Vo-Ag Instructor)
Industrial Grounds Maintenance Person
Golf Course Employee
City, State and National Park Employee
State Gardener
Highway Maintenance Person
Park Superintendent
Groundskeeper
Park Superintendent
Director of Seed Company
Editor-Horticultural Publications
Landscape Construction
Office Worker
Physical Plant Manager
Chemical Company Representative
Horticultural Equipment Sales
Landscape Contractor
Horticultural Products Broker

HORTICULTURE CORE ELEMENTS

UNIT 2

PERSONAL DEVELOPMENT AND FFA

PURPOSE:

The purpose of this unit is to provide the student with an understanding of the relationship between vocational agriculture and the FFA, the operation of the FFA chapter, and the educational opportunities available through participation in FFA activities. Students will also develop plans for their supervised occupational experience project and set goals for their personal development.

Time Required: 2 weeks

SPECIFIC OBJECTIVES:

After completion of this unit, students will be able to:

1. Explain the history and organization of the FFA.
2. Explain the aims and purposes of the FFA.
3. List the 12 major parts or divisions of a good FFA program of work.
4. Explain the significance of the symbols on the FFA emblem.
5. Demonstrate the requirements necessary to achieve the greenhand degree.
6. Display proper social behavior and etiquette during FFA meetings and classroom discussions.
7. Move a motion for action and discuss and demonstrate basic parliamentary law.
8. List and explain 5 types of FFA member awards and contests.
9. Cite examples of FFA proficiency awards and explain how members become eligible to apply.
10. Explain the FFA skill contest program and demonstrate an interest by becoming involved.
11. Explain the importance of FFA involvement and so demonstrate by attending chapter meetings and volunteering to serve on a committee.

12. Explain the structure and activities of the National FFA Organization.
13. Develop and maintain an FFA record book.
14. Prepare and present a 3 minute speech before the class on an agricultural subject.
15. Develop an outline for their supervised occupational experience project.

UNIT OUTLINE:

I. The FFA and Vocational Agriculture.
    A. History of the Organization.
    B. Aims and Purposes.
    c. The Emblem.
    D. Requirements of Membership.
    E. Degrees of Membership.
    F. Supervised Occupational Experience Project.

II. The FFA Chapter.
    A. The Chapter Program of Work.
    B. Conducting the FFA Meeting.
    C. Parliamentary Procedure.
    D. Special FFA Activities.

III. Becoming a Leader.
    A. Developing Social Skills.
    B. Communication Skills.
    C. Personal Involvement.
    D. Earning Membership Degrees.
    E. Attending Leadership Workshops.
    F. Developing Good Study and Work Habits.

UNIT OUTLINE (continued)

IV. FFA Member Awards and Contests.

   A. Star Degree Awards.

   B. Public Speaking.

   C. Proficiency Awards.

   D. Parliamentary Procedure.

   E. Judging Contests.

V. The National FFA Organization.

   A. Structure.

   B. The National FFA Center.

VI. Record Keeping.

   A. Importance of Personal and Enterprise Record Keeping.

   B. The FFA Record Book.

SUGGESTED ACTIVITIES: (Cross references are made to sections of the Unit Outline.)

1. Have the class appoint members as officers and, with the assistance of the FFA Official Manual, stage an FFA meeting. (II)

2. Have the chapter officers come to the class and present a leadership training program. (II)

3. Use the FFA publication entitled A Self-Study Guide on FFA and have the students complete various exercises (refer to recommended reference list). (I - VI)

4. Have each student prepare and present a 1 to 3 minute public speech on an agricultural subject. Have the best presentations enter the Regional FFA 3 Minute Public Speaking Contest. (III, IV)

5. Have each student prepare and submit for review their proposed SOE project. Students having difficulty with an idea of what to do could be offered a directed practice project using school facilities. (I)

EVALUATION - UNIT 2

	Suggested Method	
Area of Evaluation	**Written**	**Performance**
1. Explain the History and Organization of the FFA. (I)	X	
2. Explain the Aims and Purposes of the FFA. (I)	X	
3. List the 12 Major Parts or Divisions of a Good FFA Program of Work. (II)	X	
4. Explain the Significance of the Symbols on the FFA Emblem. (I)	X	
5. Demonstrate the Requirements Necessary to Achieve the Greenhand Degree. (I)		X
6. Display Proper Social Behavior and Etiquette during: (III)		X
a. FFA meetings. (III)		X
b. Classroom discussions. (III)		X
7. Discuss Basic Parliamentary Procedure and: (II)	X	
a. Demonstrate parliamentary procedure. (II)		X
b. Move a motion for action. (II)		X
8. Discuss FFA Member Awards and Contests and: (IV)	X	
a. List 5 types of awards and contests. (IV)	X	
b. Explain each of the 5 types listed in (a). (IV)	X	
9. Discuss FFA Proficiency Awards and: (IV)	X	
a. Cite examples of FFA proficiency awards. (IV)	X	
b. Explain how members become eligible to apply. (IV)	X	

(Cross references are made to sections of the Unit Outline.)

EVALUATION (continued)

	Area of Evaluation	Suggested Method Written	 Performance
10.	Explain the FFA Skill Contest Program and Demonstrate an Interest by Becoming Involved. (IV)	X	X
11.	Explain the Importance of FFA Involvement and so Demonstrate by: (III)	X	
	a. Attending chapter meetings. (III)		X
	b. Volunteering to serve on a committee. (III)		X
12.	Explain the Structure and Activities of the National FFA Organization. (V)	X	
13.	FFA Record Book. (VI)	X	
14.	Unit Notebook.	X	
15.	Prepare and Present a 3 Minute Speech before the Class on an Agricultural Subject. (III, IV)	X	X
16.	Development of a Supervised Occupational Experience Project. (I)	X	

(Cross references are made to sections of the Unit Outline.)

REFERENCES:

TEXTS

Anthony, Frank, et. al. A Self Study Guide on FFA, Future Farmers of America. Alexandria, VA: National FFA Supply Service.

Erickson, Don, et. al. Student Handbook, Future Farmers of America. Alexandria, VA: National FFA Supply Service, 1982.

Official Manual, Future Farmers of America. Alexandria, VA: National FFA Supply Service, 1982.

Robert, General H. M. Robert's Rules of Order. Glenview, IL: Scott, Foresman and Co.

Chapter FFA Guide to Activities, Alexandria, VA: National FFA Supply Service.

FFA Activities Handbook, N.J. State FFA Activities Guide, New Brunswick, N.J: Education Department of Cook College, Rutgers University.

AUDIO VISUALS

FILMS

FFA - The Learning and the Land, FFA Supply Service, Alexandria, VA., 1984.

SOE - Bridging the Gap, FFA Supply Service, Alexandria, VA. 22309, 1984.

SLIDES

Orientation notebook and slides, FFA Supply Service, Alexandria, VA., 1984.

HORTICULTURE CORE ELEMENTS

UNIT 3

SOILS AND OTHER GROWING MEDIA

PURPOSE:

The purpose of this unit is to provide the student with an understanding of the origin and formation of soil, its physical and chemical composition and its contributions to plant growth.

Time Required: 3 - 4 weeks

SPECIFIC OBJECTIVES:

After completion of this unit, students will be able to:

1. Define soil and explain the 5 major factors responsible for soil formation.
2. Explain the classification of parent materials into cumulose, residual, and transported materials.
3. Explain the difference between the following residual materials: igneous, metamorphic, and sedimentary rock formations.
4. Differentiate between alluvial, colluvial, glacial, and loessial deposits.
5. Explain the importance of soil organic matter.
6. Label a diagram showing the various layers of a soil profile.
7. Explain, in general, the composition of a cubic foot of surface soil.
8. Explain how soil color is an indication of organic matter level and subsoil drainage.
9. Identify, according to size, the 3 soil particles that comprise the bulk of an average soil.
10. Explain the 3 characteristics used to describe soil structural units (peds).
11. Determine the soil texture name using both the texture triangle and mudball ribbon method.*

*Work a small amount of moist soil between the thumb and index finger. A clay soil will hold together and form a ribbon. A silt soil will form a ribbon then crumble. A coarse, sandy soil will not ribbon. (Richardson/Moore, p. 75)

SPECIFIC OBJECTIVES (continued)

12. Identify the 5 classes of soil structure based on the size of the peds.
13. List the essential requirements for plant growth supplied by the soil.
14. Identify the 16 essential elements for plant growth.
15. Identify the nutrients commonly deficient in soil.
16. Cite the pH range satisfactory for the growth of horticultural plants.
17. Explain the relationship between liming and soil nutrient release and uptake.
18. Explain the relationship between soil structure, aeration, drainage, and plant growth.
19. Discuss solutions to given soil aeration and drainage problems.
20. Explain water movement and retention in soil.
21. Demonstrate the technique for taking a representative soil sample.
22. Detect soil nutrient deficiencies with a portable test kit.
23. Determine the pH level of a soil sample.
24. Analyze a soil sample and select a readily available commercial fertilizer to compensate for any deficiencies.
25. Calculate the lime required to convert a soil pH given a specific problem.
26. Explain the special requirements of potting soil.
27. List the methods used to eliminate pests from soil used in a potting mix.
28. List the soil amendments, their advantages and disadvantages.
29. Outline the formula for an approved soilless growing media.
30. Discuss the advantages and limitations of a soilless growing media.

UNIT OUTLINE:

- I. Definition of Soil.
- II. Factors Responsible for the Formation of Soil.
  - A. Parent Materials.
    - 1. Cumulose.
    - 2. Residual.
      - a. Igneous rock.
      - b. Metamorphic rock.
      - c. Sedimentary rock.
    - 3. Transported.
  - B. Soil Horizons.
  - C. Topography.
  - D. Climate.
  - E. Plant and Animal Life.
  - F. Time.
- III. Soil Composition.
  - A. Mineral Matter.
  - B. Organic Matter.
  - C. Air.
  - D. Water.
- IV. Terms Used to Describe Soil.
  - A. Color.
  - B. Structure - Described by 3 Characteristics.
    - 1. Types of soil structure based on shape and arrangement of peds.
    - 2. Classes of soil structure based on size of peds.

UNIT OUTLINE (continued)

        a. Very fine or very thin.
        b. Fine or thin.
        c. Medium.
        d. Coarse or thick.
        e. Very coarse or very thick.
      3. Grades of soil structure based on distinctness, stability, or strength of peds.
    C. Texture.
      1. Textural classification triangle.
      2. Mudball-ribbon method of classification.

V. Soil Fertility.
    A. Essentials for Plant Growth.
    B. Plant Needs Provided by Soil.
    C. Mineral Elements.
    D. Understanding and Adjusting Soil pH.
    E. Aeration and Drainage.
    F. Modification of Texture and Structure.
    G. Soil Water.
    H. Soil Testing.
    I. Correcting Nutrient Deficiencies.

VI. Potting Soil.
    A. Requirements of Potting Soil.
    B. Control of Soil Pests.

UNIT OUTLINE (continued)

C. Soil Amendments.

D. Soil Less Mixtures.

E. Commercially Made Soilless Mixtures.

F. Advantages and Limitations of Soilless Mixtures.

G. Potting Soil for Nursery Stock.

H. Potting Soil for Greenhouse Grown Crops.

SUGGESTED ACTIVITIES: (Cross references are made to sections of the Unit Outline.)

1. Arrange a field trip to visit road cuts, gravel pits, erosion sites and other such areas to observe soil horizon characteristics. (II)

2. Have students bring in soil samples from home and place them into the proper textural classifications using the mudball-ribbon method. (IV)

3. Have each student select one of the 16 essential elements, research that element, write a report and make a presentation to the class. (V)

4. Use an area of the school grounds to demonstrate the proper technique to take a representative soil sample. (V)

5. Have students bring in soil samples from their gardens and test for pH, nitrogen, phosphorus and potassium. (V)

6. Design a work sheet with a number of fertilizer problems for the students to solve. (V)

7. Have students raise a plant species in containers using garden soil, garden soil plus amendments, and a soilles mix - compare the results. (V, VI)

8. Have students complete the activity worksheet on soils. (II - V)

ACTIVITY WORK SHEET FOR UNIT 9

SOILS

1. Explain how the factors listed below contribute to the formation of the soil.

   a. Parent Material -

   b. Climate -

   c. Plant and Animal Life -

   d. Topography -

2. Soils vary in the amounts of coarse and fine rock particles they contain. Show the variations in texture by sketching the relative size and giving the approximate size (in millimeters) for the soil particles in the section below.

Fine Gravel	Sand	Silt	Clay

Developed by John Morrow, Phillipsburg High School, Phillipsburg, New Jersey.

3. Explain how we are dependent upon the soil for the necessities of life - food, clothing and shelter.

4. What is meant by a soil profile?

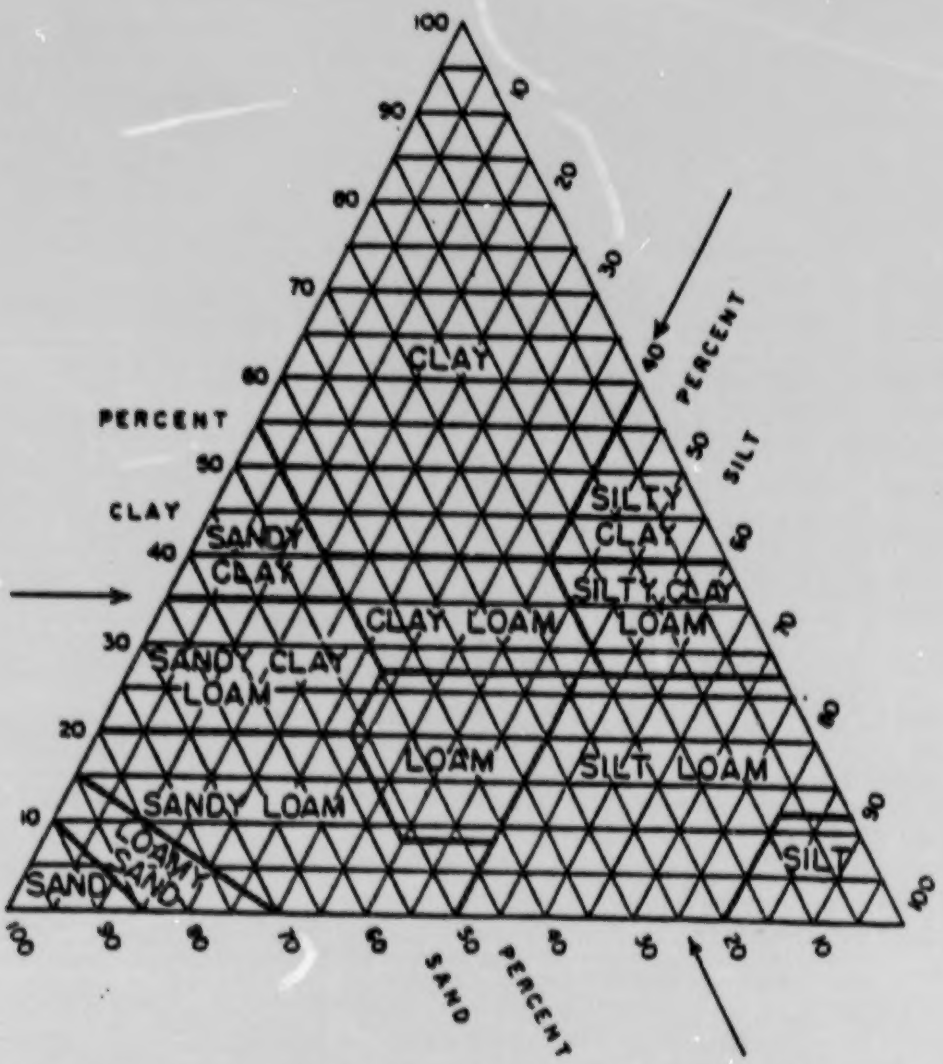
5. What are the main differences between topsoil and subsoil?

6. Why would the subsoil or B horizon have more clay particles than the topsoil or A horizon?

7. Why are coarse, open, sandy soils subject to drought?

8. Why would a loam soil be better able to supply the needed moisture than a sandy soil?

SOIL TEXTURAL CLASSIFICATION


100
90
80
70
60
50
40
30
20
10
PERCENT
CLAY
CLAY
SANDY CLAY
SILTY CLAY
SILTY CLAY LOAM
CLAY LOAM
SANDY CLAY LOAM
LOAM
SILT LOAM
SANDY LOAM
LOAMY SAND
SAND
SILT
PERCENT
SILT
SAND
PERCENT

HOW TO USE THE TEXTURAL CLASSIFICATION TRIANGLE

Locate the percent sand along the bottom of the triangle. Follow from this point UP AND TO THE LEFT, parallel with the right side of the triangle. The percent sand is constant anywhere along this line. Locate the percent clay along the left side of the triangle and follow from this point HORIZONTALLY ACROSS to the right. The textural class for the soil is shown in the area where the sand and clay percentages cross. Check the accuracy of this point by locating the percent silt along the right side of the triangle and follow DOWN AND TO THE LEFT. The percent silt should meet the intersection of the sand and clay percentages.

9. Determine the class name for the following soils. The instructor will provide the percentages of sand, silt and clay.

	% Sand	% Silt	% Clay	Soil Class Name
1.				
2.				
3.				
4.				
5.				
6.				

a. Define soil texture.

b. Will an increase in the amount of organic matter in the soil change the texture? Explain.

c. Does the class name of a soil convey any information concerning a soil beyond the percentage of separates contained?

Soil Fertility

10. List the 16 elements considered essential for plant growth. Indicate whether they come from the air, water or mineral part of the soil.

11. Some soils contain all the elements which plants need, yet they are not considered as fertile soils. Why is this?

12. Explain 2 ways in which plant nutrients can be lost from the soil.

13. In what respects does organic matter improve the fertility of the soil? Explain.

14. Of the various plant food nutrients, which are considered to be the most important and are often lacking in many soils?

15. What 3 plant nutrients are generally supplied in a commercial fertilizer?

16. What does soil pH measure?

17. What effect would a pH of 6.0 have on the growth of lawn grass?

18. How could the situation in question #17 be corrected?

19. What harm can result when fertilizer is placed too close to seeds?

20. What exactly is the meaning of 5-10-10 as it appears on a bag of fertilizer?

21. If a farmer applied 500 lbs. of 5-10-10 per acre, how many pounds of each nutrient did he apply?

22. If soil test results indicated a need for 50 lbs. of N, 100 lbs. of P and 100 lbs. of K to applied per acre, how many lbs. of 5-10-10 should the farmer apply?

23. Soil test results call for 10 lbs. of 10-5-5 to be applied per 1,000 sq.ft. on your lawn. You have 20-10-10, how many lbs. would you apply per 1,000 sq. ft.?

24. If you have 10,000 sq. ft. to fertilize in the above situation, how much fertilizer should you buy (using the 20-10-10)?

EVALUATION - UNIT 3

	Suggested Method	
Area of Evaluation	Written	Performance
1. Define Soil. (I)	X	
2. Explain 5 Major Factors Responsible for Soil Formation. (II)	X	
3. Explain Classification of Parent Materials into: (II)	X	
a. Cumulose.	X	
b. Residual.	X	
c. Transported.	X	
4. Explain the Difference Between the Following Residual Materials: (II)	X	
a. Igneous.	X	
b. Metamorphic.	X	
c. Sedimentary.	X	
5. Differentiate Between: (II)		
a. Alluvial.	X	
b. Coluvial.	X	
c. Glacial.	X	
d. Loessial.	X	
6. Explain Importance of Soil Organic Matter. (III)	X	
7. Label Diagram Showing Layers of a Soil Profile. (II, III)	X	
8. Explain Composition of a Cubic Foot of Surface Soil. (III)	X	
9. Explain How Soil Color is an Indication of Organic Matter Level and Subsoil Drainage. (IV, V)	X	

(Cross references are made to sections of the Unit Outline.)

EVALUATION (continued)

	Suggested Method	
Area of Evaluation	Written	Performance
10. Identify, by Size, 3 Soil Particles that Comprise the Bulk of an Average Soil. (IV)		X
11. Explain 3 Characteristics Used to Describe Soil Structural Units (Peds).	X	
12. Determine Soil Texture Name Using: (IV)		X
a. Texture triangle.		X
b. Mudball-ribbon method.		X
13. Identify 5 Classes of Soil Structure Based on Ped Size. (IV)		X
14. List Essential Requirements for Plant Growth Supplied by Soil. (V)	X	
15. Identify 16 Essential Elements for Plant Growth and: (V)	X	
a. Write a report on one element.	X	
b. Present report to class.		X
16. Identify Nutrients Commonly Deficient in Soil. (V)	X	
17. Cite pH Range Satisfactory for Growth of Horticulture Plants. (V)	X	
18. Explain Relationship Between Liming and Soil Nutrient Release and Uptake. (V)	X	
19. Explain Relationship Between Soil Structure, Aeration, Drainage, and Plant Growth. (V)	X	
20. Discuss Solutions to Given Soil Aeration and Drainage Problems. (V)	X	
21. Explain Water Movement and Retention in Soil. (V)	X	

(Cross references are made to sections of the Unit Outline.)

EVALUATION (continued)

Area of Evaluation	Suggested Method Written	 Performance
22. Demonstrate Technique for Taking a Representative Soil Sample and: (V)		X
a. Detect soil nutrient deficiencies with portable test kit.		X
b. Select commercial fertilizer to compensate for deficiencies.		X
c. Determine pH level.		X
23. Given a Specific Problem, Calculate Lime Required to Convert a Soil pH. (V)		X
24. Explain Special Requirements of Potting Soil. (VI)	X	
25. List Methods Used to Eliminate Pests From a Potting Soil Mix. (VI)	X	
26. List Soil Amendments. (VI)	X	
27. Outline Formula for Approved Soilless Growing Media. (VI)	X	
28. Discuss Advantages and Limitations of Soilless Growing Media. (VI)	X	
29. Raise a Plant Species in Containers and Compare Results Using: (V, VI)		X
a. Garden soil. (V)		X
b. Garden soil and amendments. (V, VI)		X
c. Soilless mix. (VI)		X
30. Completion of Activity Work Sheet for Unit 9. (I - VI)	X	
31. Safe and Professional Work Habits.		X
32. Unit Notebook.	X	

(Cross references are made to sections of the Unit Outline.)

REFERENCES:

TEXTS

Baudendistel, R. F. Horticulture: A Basic Awareness. Reston, VA: Reston Publishing Co., Inc., 1978.

Jones, U. S. Fertilizers and Soil Fertility. Reston, VA: Reston Publishing Co., Inc., 1979.

McDaniel, G. L. Ornamental Horticulture. Reston, VA: Reston Publishing Co., Inc., 1979.

AUDIO VISUALS

Slide/Cassette Sets

- Introduction to Soils
- Soil Components
- Texture
- Structure
- Moisture
- pH and Limestone

Available from:

Hobar Publications
1234 Tiller Lane
St. Paul, MN 55112

All available from Vocational Education Productions, Cal Poly State University, San Luis Obispo, CA.

COMPUTER

Soil Evaluation, Fertility and Related Review, Hobar Publications, 1234 Tiller Lane, St. Paul, MN.

HORTICULTURE CORE ELEMENTS

UNIT 4

GENERAL KNOWLEDGE OF PLANTS

PURPOSE:

The purpose of this unit is to provide the student with the information and learning activities necessary to develop a foundation in understanding plant morphology, physiology, reproduction and classification.

Est. Time Required: 4 - 5 wks.

SPECIFIC OBJECTIVES:

After completion of this unit, students will be able to:

1. Define all terms necessary to accurately describe the morphology, physiology, reproduction and classification of horticultural plants.
2. Explain the binomial system of plant nomenclature and why it is important to be familiar with the genus and species names of many horticultural plants.
3. List the 3 main functions of the root.
4. Explain the difference between a fibrous root and a tap root system and how the type of roots affect plant culture.
5. Identify the cambium, cortex, epidermis, phloem, xylem, and meristematic tissue of the root and explain the purpose of each.
6. Define osmosis and explain its role in plants.
7. Explain the internal structure of the stem and the function of the various tissues.
8. Identify the opposite and alternate arrangement of buds, branches and leaves on the stem and cite examples for each.
9. Identify compound and simple leaves and cite examples of each.
10. Explain the internal structure of the leaf and how the tissues relate to the manufacture of food.
11. Explain the processes of photosynthesis and respiration and how they result in the growth of the plant.

SPECIFIC OBJECTIVES (continued)

12. Identify the parts of the flower and explain their role in the plant's reproductive process.
13. Explain the difference between complete and incomplete flower and give examples of each.
14. Identify the parts of the seed and explain the requirements for germination.
15. Demonstrate the proper technique for testing seeds and determine the germination percentage.
16. Demonstrate the proper technique for transplanting seedlings.
17. Demonstrate the proper technique for making stem cuttings and explain the requirements necessary for rooting.
18. List the various ways plants reproduce vegetatively and cite examples for each.
19. Demonstrate the proper techniques to make the more common grafts; saddle, t-budding, cleft, and whip and tongue.
20. Explain how normal plant growth is achieved taking into account the basic needs of the plant and its major organs and physiological processes.
21. Identify 15 common trees of New Jersey.

UNIT OUTLINE:

I. Plant Classification.

    A. Horticultural Classification.

        1. Fruits.
        2. Vegetables.
        3. Ornamental.

    B. Botanical Classification.

        1. Major phylums.
        2. Binomial naming system.
        3. Horticulture application.

II. Morphology.

    A. The Cell.

        1. Cell wall.
        2. Nucleus.
        3. Plasma membrane.
        4. Plastids.
        5. Vacuole.
        6. Tissue.
        7. Organ.

UNIT OUTLINE (continued)

- B. The Root.
    - 1. Types of root systems.
    - 2. Functions of the root.
    - 3. Tissue structure.
    - 4. Special roots.
- C. The Stem.
    - 1. Functions of the stem.
    - 2. Internal structure.
    - 3. External features of the woody stem.
    - 4. Types of branching.
    - 5. Leaf arrangement.
    - 6. Types of stems.
    - 7. Making stem cuttings.
- D. Leaves.
    - 1. Function.
    - 2. External features.
    - 3. Internal structure.
    - 4. Compound vs. simple.
- E. Flower.
    - 1. Function.
    - 2. Structure.
    - 3. Types of flower.
- F. Fruits.
    - 1. Function.
    - 2. Classification.
- G. Seeds.
    - 1. Identify parts.
    - 2. Monocot structure.
    - 3. Dicot structure.

III. Plant Physiology.

- A. Requirements for Growth.
    - 1. Air.
    - 2. Growing media.
    - 3. Mineral elements.
    - 4. Sunlight.
    - 5. Temperature.
    - 6. Water.

UNIT OUTLINE (continued)

B. Seed Germination.
   1. Requirements.
   2. Techniques for germination.
   3. Techniques for transplanting.
   4. Calculating germination percentage.

C. Roots.
   1. Osmosis.
   2. Root hairs.
   3. Turgor pressure.
   4. Reverse osmosis.
   5. Selective absorption.

D. Movement of Water in the Stem.
   1. Osmotic pressure.
   2. Transpiration of water from the leaf.

E. Movement of Food in the Stem.
   1. Translocation.
   2. Sap flow in perennials.

F. Process of Growth.
   1. Absorption.
   2. Assimilation.
   3. Photosynthesis.
   4. Respiration.

G. Tropisms.
   1. Geotropism.
   2. Hydrotropism.
   3. Phototropism.
   4. Thigmotropism.

IV. Plant Propagation.

A. Sexual.
   1. Section II, G and III, B.
   2. Advantages and disadvantages.
   3. Basic Plant Genetics.

B. Asexual.
   1. Factors affecting propagation.
   2. Types of asexual propagation.
   3. Propagation techniques.
   4. Making a graft.

SUGGESTED ACTIVITIES: (Cross references are made to sections of the Unit Outline.)

1. Prepare a collection of plants showing the different plant systems including roots, flower, and foliage. (II)

2. Germinate seeds and record the stages of germination and the percent germination. (II, III)

3. Conduct experiments on photosynthesis by controlling temperature, moisture and light. (III)

4. Conduct experiments on transpiration using food coloring. (III)

5. Prepare herbaceous and woody stem cuttings and observe the rooting procedure. (II, III)

6. Prepare a chart showing the different types of grafts. (IV)

7. Prepare a Herbarium. (I)

    A. Purpose:

    In order for students to be able to compete effectively in the nursery/landscaping field, they must have a sound working understanding of several hundred woody landscape plants. It is essential, therefore, that students begin to learn the plants early in their vo-ag education.

    B. Specific Objectives for Suggested Activity #7:

    1. Students will identify 15 common landscape trees and 5 common shrubs.

    2. Students will list 20 botanical names.

    3. Students will apply the terms used in plant classification.

    4. Students will demonstrate the use of identification resources.

    5. Students will list, identify and describe common plants in the community.

    C. Procedure: This activity is intended to be both an in-school and out-of-school project completed in a maximum of 3 weeks.

    1. Have students collect the following for a total of 20 specimens:

        a. Leaves and branches from 10 deciduous trees.

        b. Leaves and branches from 5 broad leaf evergreens, 5 narrow leaf evergreens and/or deciduous shrubs.

SUGGESTED ACTIVITIES (continued)

    c. Leaves from 5 evergreen trees.

2. Instruct students on how to properly dry their leaves between weighted sheets of newspaper.

3. Have students mount specimens on 8½ x 11 inch sheets of plain white paper using clear cellophane tape.

4. Each sheet with a mounted specimen will also contain the following descriptive information:

    a. Common name.

    b. Botanical name.

    c. Morphology of the leaf (simple, pinnately compound or palmately compound; alternate or opposite, etc.).

    d. Horticultural classification (deciduous tree or shrub, broad leaf evergreen tree or shrub, or narrow leaf evergreen tree or shrub).

5. All 20 sheets will be put together with a title page, index and enclosed in a report cover.

6. Assistance to students.

    a. Provide students with a detailed outline of the project, and any additional materials as budget resources permit.

    b. Conduct several walks around school grounds and residential areas close to school for the purpose of plant identification and the study of plant morphology.

    c. Provide a selection of plant identification manuals.

    d. Show filmstrip or slide programs on plant identification.

    e. Conduct several labs where students can receive individual help in identification of their specimens.

D. Evaluation: A suggested format for evaluation of this activity would be:

1. 2 points for each correctly identified specimen.	40 points

SUGGESTED ACTIVITIES (continued)

2. 2 points for each correct set of descriptive information	40 points
3. Neatness	10 points
4. Correct presentation	10 points
Total -	100 points

EVALUATION - UNIT 4

	Suggested Methods	
Area of Evaluation	**Written**	**Performance**
1. Define Vocabulary Related to:		
a. Classification. (I)	X	
b. Morphology. (II)	X	
c. Physiology. (III)	X	
d. Reproduction. (IV)	X	
2. Explain Binomial System of Plant Nomenclature. (I)	X	
3. Identify 3 Main Root Functions and: (II)	X	
a. Explain fibrous root. (II)	X	
b. Explain tap root. (II)	X	
4. Identify and Define the Following: (II)		
a. Cambium.	X	
b. Cortex.	X	
c. Epidermis.	X	
d. Meristematic tissue.	X	
e. Phloem.	X	
f. Xylem.	X	
5. Principle of Osmosis. (III)	X	
6. Label the Internal Structures of a Stem and: (II)	X	
a. Explain the function of the tissues (II)	X	

(Cross references are made to sections of the Unit Outline.)

EVALUATION (continued)

Area of Evaluation	Suggested Methods	
	Written	Performance
b. Explain opposite and alternate arrangements of buds, branches and leaves on the stem. (II)	X	
1. Identify them on different plants. (II)	X	X
2. Cite examples of each. (II)	X	
7. Explain the Difference Between Compound and Simple Leaves and: (II)	X	
a. Identify them on different plants. (II)	X	X
b. Cite examples of each. (II)	X	
c. Explain the internal structure. (II)	X	
d. Explain how food is manufactured. (II)	X	
8. Explain Photosynthesis. (III)	X	
9. Explain Respiration. (III)	X	
10. Identify Flower Parts and: (II)	X	
a. Explain their function in reproduction. (II, IV)	X	
b. Explain complete vs. incomplete flowers. (II)	X	
11. Identify Seed Parts and: (II)	X	
a. Explain requirements for germination. (III)	X	
b. Demonstrate techniques for germination. (III)		X

(Cross references are made to sections of the Unit Outline.)

EVALUATION (continued)

	Suggested Method	
Area of Evaluation	Written	Performance
c. Calculate germination percentage. (III)		X
d. Demonstrate techniques for transplanting. (III)		X
12. Demonstrate Techniques for Making Stem Cuttings. (II)		X
13. Explain Rooting Requirements. (III)	X	
14. Vegetative Reproduction. (IV)	X	
a. Methods of vegetative reproduction. (IV)	X	X
b. Cite examples. (IV)	X	
15. Demonstrate Techniques for Making a Graft. (IV)		X
16. Synthesizing Your Knowledge from Section III of the Unit Outline - Explain Plant Growth. (II-IV)	X	
17. Preparation of a Herbarium (II)	X	X
18. Safe and Professional Work Habits		X
19. Unit Notebook.	X	

(Cross references are made to sections of the Unit Outline.)

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Baudendistel, R. F. Horticulture: A Basic Awareness. Reston, VA: Reston Publishing Co., Inc. 1978.

Otto, J. H. & Jowle, A. Modern Biology. NY: Holt, Rinehart and Winston, Publishers, 1973.

Richardson, W. B. & Moore, G. E. Working in Horticulture. NY: Gregg Division/McGraw Hill Book Co., 1980.

Hartman, H. T. & D. E. Kester. Plant Propagation: Principles and Practices. Prentice Hall, Inc., Englewood Cliffs, New Jersey.

AUDIO VISUALS

Basics of Botany: Filmstrip set w/cassettes and reproducible masters. The green plant. Plant Competition, Educational Images Ltd., P.O. Box 367, Lyons Falls, N.Y. 11368.

COMPUTER SOFTWARE

Nasco, 901 Janesville Ave., Fort Ackinson, WI. 53538.
Photosynthesis and Transport
Reproduction Plants: asexual and sexual
Genetics: peas, 4 o'clocks and fruit flies
for 48K apple 11, 11+, 11e
32K TRS-80 Model 111

OTHER

Free Catalogue of films on "How Plants Grow." Available from University of California Extension Media Center, 222 Fulton St., Berkeley, CA. 94804

Visual Media, University of California, Davis, CA. 95616

Basic Plant Science, California Vocational Agriculture Curriculum Guidelines Instructional Unit: Ornamental Horticulture. Cal Poly Tech. San Luis Obispo, CA.

HORTICULTURE CORE ELEMENTS

UNIT 5

GENERAL SAFETY PROCEDURES

PURPOSE:

The purpose of this unit is to provide the student with an understanding and appreciation of the need to employ safety practices when working with tools and equipment in the agricultural field.

Est. Time Required: 2 wks.

SPECIFIC OBJECTIVES:

After completion of this unit, students will be able to:

1. Use proper personal safety precautions regarding clothing, eye, and ear protection.
2. Demonstrate safe working habits.
3. Identify potential fire hazards in the shop and make the necessary corrections.
4. Demonstrate safe use of hand tools.
5. Demonstrate safe use of stationary and portable power tools.
6. Demonstrate safe use of electric arc and oxyacetylene welding equipment.
7. Demonstrate safe equipment maintenance skills.
8. Demonstrate safe operation of field equipment in accordance with an operator's manual.
9. Handle fuels and also inflammable materials safely.
10. Explain the factors one would consider in order to develop a safe farm, agribusiness or home workshop.

UNIT OUTLINE:

I. Personal Safety.

   A. Proper Clothing.

      1. Proper fit.

      2. Protection against burns.

   B. Proper Eye Protection.

      1. Eye protection for general work.

      2. Eye protection for welding.

   C. Proper Ear Protection.

   D. Use of a Respirator.

   E. Knowledge of First Aid Materials and Procedures.

II. Safe Working Habits in the Agricultural Shop.

   A. Safe Organization of the Agricultural Shop.

   B. Mature Working Attitudes.

   C. Importance of Clean Working Conditions.

   D. Proper Tool and Equipment Storage.

III. Identify Potential Fire Hazards and Have Knowledge of Fire Control.

   A. Know Location of Fire Extinguishers.

   B. Know the Different Types of Fire Extinguishers and How Each is Used.

IV. Using Hand Tools Safely.

   A. Using the Correct Tool for a Specific Job.

   B. Keeping Tools in Good Condition.

   C. Proper Identification and Use of Tools.

UNIT OUTLINE (continued)

V. Using Power Tools and Equipment Safely.

   A. Proper Identification, Use and Selection of Portable and Stationary Power Tools.

      1. Drills and grinders.

      2. Power saws.

      3. Steam cleaners.

      4. Compressors.

      5. Chain saws.

      6. Farm equipment.

         a. Tractors.

         b. Tillage tools.

         c. Harvesting equipment.

      7. Horticultural Equipment.

         a. Tractors.

         b. Lawn mowers.

         c. Rototillers, thatchers, aerators.

         d. Shredders and chippers.

         e. Post hole diggers.

         f. Pesticide application equipment.

   B. Practicing Electrical Safety.

      1. Extension cords.

      2. Proper grounding and plugs.

   C. Becoming Familiar with Equipment Operating Manuals.

      1. Machinery guards.

      2. Belts, pulleys, and other moving parts.

UNIT OUTLINE (continued)

VI. Safe Welding Procedures.

- A. Setting Up Equipment Properly.
- B. Using Equipment Properly.
- C. Operating Gas and Arc Units Safely.
  - 1. Proper dress.
  - 2. Proper eye care.
  - 3. Protection from hot metals.
- D. Diagnosing Problems.
  - 1. Check for gas leaks.
  - 2. Maintenance of welding equipment.

VII. Safe Equipment Maintenance.

- A. Selection and Proper Use of Hand Tools.
- B. Selection and Proper Use of Hoists, Jacks and Other Supports.
- C. Maintain Equipment According to Operator's Manual.

VIII. Operate Equipment Safely.

- A. Observe and Follow Suggestions in Operator's Manual.
- B. Use Equipment for its Intended Purpose.
- C. Use Equipment within its Recommended Operating Speeds.
- D. Employ All Equipment Safety Features.

IX. Handling of Fuels and Also Inflammable Materials.

- A. Refueling Safely.
- B. Safe and Proper Storage of Inflammable Materials.

UNIT OUTLINE (continued)

X. Develop Safe Working Conditions.

   A. Set Up a Safe Agricultural Shop.

      1. Equipment arrangement.
      2. Storage of flammable materials.
      3. Safe color-coding.
      4. Proper ventilation.
      5. Safety power switches.
      6. Fire prevention and control.
      7. First aid considerations.

SUGGESTED ACTIVITIES: (Cross references are made to sections of the Unit Outline.)

1. Tour the agricultural shop and acquaint students with safety shut-off switches, color-coding, safety zones, exits, fire extinguisher stations, fire blanket, eye wash station, first aid kit, and machine safety guards. (II)
2. Develop standards for personal safety. Have students provide proper clothing for themselves. Assign eye protection devices and provide ear plugs and respirators when needed. (I)
3. Display safety logos and posters. (I)
4. Have the school nurse speak to students on general first aid for common accidents that may occur in the agricultural shop. Review procedures for reporting accidents. (I)
5. Have the local rescue squad give a demonstration on first aid practices for common shop accidents. (I)
6. Show films on eye safety and general shop safety. (II)
7. Acquaint students with tool storage areas and the need for proper tool storage. (II)
8. Demonstrate the safe and proper use of hand tools and power equipment. (IV-VIII)

SUGGESTED ACTIVITIES (continued)

9. Give skill assignments to students on the use of hand tools and power equipment. (IV-VIII)

10. Conduct a safe tractor driving contest. (IV-VIII)

11. Promote and establish a safety program in the agricultural shop and community based on the National FFA Safety Award Program. (IV-VIII)

12. Conduct a field trip to an agricultural business that exhibits model safety practices. (IX, X)

13. Have students develop a plan for an agricultural shop that meets their needs and complies with safety standards. (X)

14. Maintain a student safety chart indicating their performance. (I)

EVALUATION - UNIT 5

	Suggested Method	
Area of Evaluation	Written	Performance
1. Use Proper Personal Safety Precautions Regarding: (I)		X
a. Clothing. (I)		X
b. Eye protection. (I)		X
c. Ear protection. (I)		X
d. Use of a respirator. (I)		X
2. Knowledge of General First Aid Materials and Procedures. (I)	X	
3. Demonstrate Safe Working Habits. (II)		X
a. Safe organization of agricultural shop. (II)		X
b. Mature working attitude. (II)		X
c. Importance of clean work areas. (II)		X
4. Fire Hazards: (III, X)		
a. Identify potential fire hazards. (III, X)	X	X
b. Make necessary corrections to alleviate fire hazards. (III, X)		X
c. Know different types of fire extinguishers and how each is used. (III, X)	X	X
5. Demonstrate Safe Use of Hand Tools. (IV)		X
a. Proper identification and use of tools. (IV)	X	X
b. Select the correct tool for a specific job. (IV)		X
c. Keep tools in good condition. (IV)	X	X

(Cross references are made to sections of the Unit Outline.)

EVALUATION (continued)

Area of Evaluation	Suggested Method	
	Written	Performance
6. Demonstrate Safe Use of Stationary and Portable Power Tools. (V)		X
a. Proper use and identification of tools. (V)	X	X
b. Select the correct tool for a specific job. (V)		X
c. Electrical safety. (V)	X	X
d. Knowledge of equipment operating manual. (V)	X	
7. Demonstrate Safe Use of Electric Arc and Oxyacetylene Welding Equipment. (VI)		X
a. Proper set up of equipment. (VI)		X
b. Proper and safe use of equipment. (VI)		X
c. Diagnosing problems. (VI)		X
8. Demonstrate Safe Equipment Maintenance. (VII-VIII)		X
a. Proper use of hand tools. (VII-VIII)		X
b. Select correct tool for a specific job. (VII-VIII)		X
c. Maintain equipment according to standards of operator's manual. (VII-VIII)		X
9. Demonstrate Safe Operation of Field Equipment in Accordance with an Operator's Manual. (VII-VIII)		X
10. Handling Fuels and Also Inflammable Materials. (IX)		X
a. Re-fueling safely. (IX)		X
b. Safe and proper storage of fuels and also inflammable materials. (IX)		X
11. Explain Factors One Would Consider in Order to Develop a Safe Farm, Agribusiness or Home Workshop. (I-X)	X	

(Cross references are made to sections of the Unit Outline.)

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HORTICULTURE CORE ELEMENTS

UNIT 6

HORTICULTURAL HAND TOOLS

PURPOSE:

The purpose of this unit is to provide the student with information on the safe and proper selection, use, and maintenance of tools needed in the horticultural industry.

Est. Time Required: 2 wks.

SPECIFIC OBJECTIVES:

After the completion of this unit, students will be able to:

1. Identify tools and determine proper tool use.
2. Identify the criteria for tool selection.
3. Discuss the safe and proper use, maintenance and repair of tools.
4. Demonstrate safe and professional work habits when using tools.

UNIT OUTLINE:

I. Types of Tools and Their Functions

  A. Pruning Tools.

    1. Hand pruners.

    2. Loppers.

    3. Pruning saws.

    4. Pole pruners and saws.

  B. Planting Tools.

    1. Digging.

      a. Spades.

      b. Shovels.

      c. Spading forks.

UNIT OUTLINE (continued)

- d. Trowels.
- e. Planting bars and picks.
- f. Mattocks.

2. Cultivating and leveling.
   - a. Cultivators.
   - b. Hoes.
   - c. Rakes.
   - d. Potato hook.
3. Cleanup.
   - a. Brooms.
   - b. Fan rakes.
   - c. Canvas.
   - d. Wheelbarrow.
   - e. Vacuums and blowers.

C. Watering Tools.
   - a. Nozzle.
   - b. Sprinklers.
   - c. Hoses.

D. Maintenance Tools.
   - a. Basic hand tools.
   - b. Files.
   - c. Grinders.
   - d. Oilstones.
   - e. Pipe wrench.

II. Selection of Tools.
   - A. Nature of Job and Effectiveness of Use.
   - B. Cost and Quality.

UNIT OUTLINE (continued)

1. Quality of steel.
2. Quality of handle.
3. Balance and weight of tool.
4. Ease of maintenance of tool.

C. Safety Features of Tool.

III. Use of Tools.

A. Procedures and Techniques of Tool Usage.

B. Safety Procedures.

C. Cleaning, Sharpening and Storage of Tools.

IV. Tool Safety.

A. Causes of Accidents and First Aid.

B. Moving and Lifting Heavy Objects.

C. Using Sharp Tools.

D. Using Sharp Tools with Movable Parts.

E. Keeping the Work Area Clean.

SUGGESTED ACTIVITIES: (Cross references are made to sections of the Unit Outline.)

1. Recondition hand tools belonging to the school, students, local businesses, etc. Emphasize replacing handles, removing rust, sharpening, oiling and proper storage of tools. (I-IV)

2. Have students record their tool maintenance activities in their student record books as skills are learned and performed. (I, III)

3. Have students use appropriate tools under supervision to perform tasks on the school grounds such as pruning, planting, watering, etc. (I-IV)

4. Have students participate in ordering of new tools for the agricultural department, acquainting them with catalogs used and the differences in tool specifications, quality and prices. (I, II)

5. Have students inventory school horticulture tools at the end of the school year and assess the condition of the tools on inventory. (I, II)

EVALUATION - UNIT 6

Area of Evaluation	Suggested Method	
	Written	Performance
1. Identify Tools Used for: (I)		X
a. Pruning. (I)		X
b. Planting. (I)		X
c. Watering. (I)		X
d. Maintenance. (I)		X
2. Determine Safe and Proper Use of Tools for: (I - IV)	X	X
a. Pruning. (I - IV)	X	X
b. Planting. (I - IV)	X	X
c. Watering. (I - IV)	X	X
d. Maintenance. (I - IV)	X	X
3. Discuss the Safe and Proper Maintenance and Repair of Tools. (II - IV)	X	
4. Safe and Professional Work Habits. (III, IV)	X	X
5. Unit Notebook	X	

(Cross references are made to sections of the Unit Outline)

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HORTICULTURE CORE ELEMENTS

UNIT 7

BASIC HORTICULTURAL PRACTICES

PURPOSE:

The purpose of this unit is to provide the student with the information and learning activities necessary to develop a foundation in understanding irrigation, pruning, planting and transplanting.

Est. Time Required: 4 - 5 wks.

SPECIFIC OBJECTIVES:

After completion of this unit, students will be able to:

1. Define vocabulary associated with irrigation.
2. List four types of irrigation methods.
3. Explain two advantages and two disadvantages of each of the four major types of irrigation methods.
4. List three basic types of greenhouse watering systems.
5. List three ways water is distributed in surface irrigation.
6. List three ways water is distributed in sprinkler irrigation.
7. List three factors that determine irrigation requirements.
8. List two methods of determining irrigation requirements.
9. Explain and demonstrate methods of measuring soil moisture.
10. List the various factors that determine the consumptive-use of water.
11. Outline the procedure for determining a consumptive-use index.
12. List the major factors affecting the efficiency of irrigation.
13. Define vocabulary associated with pruning.
14. Explain four major reasons for pruning.
15. List, explain and demonstrate the five basic methods of pruning.

SPECIFIC OBJECTIVES (continued)

16. Identify and demonstrate proper use of the hand tools necessary for various pruning situations.

17. Select the appropriate tool given a particular pruning situation.

18. Explain the proper times to prune the various deciduous shrubs.

19. Explain the difference between formal and informal pruning of shrubs.

20. Explain the proper times to prune the various broadleaf evergreen shrubs.

21. Explain the proper times to prune the various narrowleaf evergreen shrubs.

22. Explain the proper times for pruning ornamental trees.

23. Demonstrate the correct technique for removing various sized limbs from ornamental trees.

24. Explain the need for safety consciousness when performing maintenance tasks and so demonstrate.

25. List the four general rules for pruning to strengthen trunk and branches.

26. Explain the rules for pruning young trees.

27. List and explain three forms to which fruit trees are trained.

28. List and explain the different periods in the life of a fruit tree.

29. Explain the fruiting habits of the various tree fruits.

30. Explain the fruiting habits of the grape and brambleberries.

31. List and explain four systems of training and pruning grapes.

32. List the general rules for pruning brambleberries.

33. Identify the major types of roses.

34. Explain the proper time to prune roses.

35. List four general rules and demonstrate pruning roses.

36. Identify the tools and supplies needed to repair damaged and diseased trees and shrubs.

37. List the steps in treating diseased or decayed areas of trees or shrubs.

38. List and demonstrate the steps in treating damaged bark.

SPECIFIC OBJECTIVES (continued)

39. List the steps in cabling and supporting branches.

40. Define vocabulary associated with planting and transplanting.

41. Explain the proper time of the year to plant woody ornamentals.

42. Determine the fertilizer, lime and organic matter needs of a soil before planting nursery stock.

43. Demonstrate the proper procedure for planting, bare-root, balled and burlapped and containerized nursery stock.

44. Demonstrate and explain the proper procedure for staking, guying and wrapping the trunk of newly planted trees and shrubs.

45. Explain the proper time to plant bulbs.

46. Demonstrate the proper procedure for planting bulbs.

47. Demonstrate the proper technique for planting small herbaceous plants.

48. Select and/or prepare a growing media for greenhouse potting.

49. Demonstrate the correct technique for transplanting seedlings.

50. Demonstrate the proper procedure for potting rooted cuttings.

51. Demonstrate the procedure for repotting floriculture plants.

52. Suggest fertilizer applications at the time of potting.

53. Identify the types of growing structures used to produce horticultural plants.

54. Explain the use of the various structures.

55. Explain the uses for the various types of greenhouses.

56. Explain the advantages and disadvantages of the materials used in greenhouse construction.

57. Identify and communicate facts about 30 commonly used green plants.

58. Design and plant dish gardens or planters and communicate facts about their construction and care.

59. Understand, apply and explain fertilizing of potted green plants.

60. Identify and control house plant insects and diseases.

SPECIFIC OBJECTIVES (continued)

61. List steps and key points in establishing a home lawn from seed.

62. List steps and key points in establishing a home lawn with sod.

63. Explain advantages and disadvantages of sod vs. seed.

64. Outline the procedure for caring for a home lawn properly.

65. Evaluate an established lawn and make suggestions for its improvement.

UNIT OUTLINE:

I. Irrigation.

  A. Water Management.

  B. Land Irrigation.

    1. Methods of distribution.

    2. Principles of use.

    3. Advantages and disadvantages.

  C. Greenhouse Irrigation.

    1. Types of systems.

    2. Equipment.

    3. Advantages and disadvantages.

  D. Calculating Water Needs.

    1. Factors determining irrigation requirements.

    2. Methods of measuring soil moisture.

    3. Developing a consumptive-use index.

    4. Factors affecting irrigation efficiency.

II. Pruning

  A. Purposes.

  B. When to Prune.

  C. Methods of Pruning.

UNIT OUTLINE (continued)

1. Stem.
2. Root.
3. Heading-back.
4. Thinning-out.
5. Shearing.

D. Identification and Use of Pruning Tools.

E. Pruning Shrubs.
   1. When to prune.
   2. General rules.
   3. Pruning techniques.

F. Pruning Ornamental Trees.
   1. General rules
   2. Pruning evergreen trees.
   3. Pruning deciduous trees.
   4. Pruning to strengthen trunk and branches.
   5. Pruning after planting.

G. Pruning Fruit Trees.
   1. Training systems.
   2. Stages of growth.
   3. Pruning techniques.

H. Pruning Grapes and Brambleberries.
   1. Fruiting habits.
   2. Training systems.
   3. Pruning techniques.

I. Pruning Roses.
   1. Types of roses.
   2. When to prune.
   3. Pruning techniques.

UNIT OUTLINE (continued)

J. Repairing Damaged Trees.

1. Tools and equipment.
2. Treating diseased and decayed tissue.
3. Repairing damaged bark.
4. Cabling and supporting limbs.

III. Planting and Transplanting.

A. Planting Ornamentals.

1. When to plant.
2. Soil preparation.
3. Liming and fertilization.
4. Planting bare-root stock.
5. Planting balled and burlapped and containerized stock.
6. Care of newly planted stock.
7. Planting bulbs.
8. Planting groundcovers.
9. Planting annual and perennial flowers.

B. Greenhouse Potting.

1. Soil preparation.
2. Transplanting seedlings.
3. Potting rooted cuttings.
4. Repotting foliage plants.
5. Repotting orchids.
6. Fertilization.

IV. Plant Growing Structures.

A. Types of Structures.

1. Greenhouse.
2. Shade House.
3. Cold Frame.
4. Wintering Houses.

B. The Greenhouse.

1. Type.
2. Structural Parts.
3. Covering Materials.

UNIT OUTLINE (continued)

- 4. Layout and Interior.

V. Houseplants.

- A. Identification of common houseplants.
- B. Care of houseplants.
  - 1. Light
  - 2. Watering
  - 3. Temperature and humidity.
  - 4. Pests.
- C. Using houseplants.
  - 1. Terrariums
  - 2. Dish gardens.
  - 3. Planters.

VI. Home Lawns.

- A. Establishing a lawn from seed.
- B. Establishing a lawn from sod.
- C. Care of home lawn.
  - 1. Watering.
  - 2. Mowing.
  - 3. Fertilizing.
  - 4. Lawn problems.
- D. Renovating a home lawn.

SUGGESTED ACTIVITIES: (Cross references are made to sections of the Unit Outline.)

1. Visit a nursery or garden center and gather information on the latest irrigation equipment. (I)

2. Using the school greenhouse and/or land laboratory, have students set-up several types of irrigation systems and observe their effectiveness. (I)

3. Conduct a laboratory exercise to have students determine soil moisture by the "feel" method and the gravimetric system. (II)

4. Prune ornamental trees and shrubs on the school grounds. (II)

SUGGESTED ACTIVITIES: (continued)

5. Arrange for a local tree surgeon the conduct a workshop on pruning safety and demonstrate the various skills needed. (II)

6. Have students prepare a series of slides on pruning ornamentals. Have the FFA present the program to local organizations. (II)

7. Build a trellis and establish a grape planting of several varieties. (II)

8. Visit an orchard and have students compare training systems and the various stages of plant development in relationship to production. (II)

9. Plant one each of the three types of nursery stock. (III)

10. Using the school greenhouse, have students participate in the production of a crop of bedding plants to gain practice in potting seedlings and/or rooted cuttings. (III)

11. Penn State University Ornamental Horticulture Task Sheets:

    a. LC-15 Removing Tree Limbs. (II)
    b. NP-3 Root-Pruning Trees. (II)
    c. NP-19 Pruning Pines for Dense Growth. (II)
    d. NP-18 Replacing a Lost Leader. (II)
    e. LC-1 Planting Bare-Root Trees. (III)
    f. LC-2 Planting a Balled and Burlapped Shrub. (III)
    g. NP-14 Transplanting Nursery Stock from Pots to Containers. (III)
    h. GCP-7 Transplanting Rooted Cuttings into Pots. (III)
    i. LC-20 Planting Annual Flowers. (III)

12. Arrange a field trip to local greenhouses to study their use, construction, layout and function. (IV)

13. Have students do an espalier or bonsai project. Have local florist, nurseryman or garden club member speak on these topics and perhaps demonstrate these processes. (II)

14. Have students design and plant a dish garden, terrarium or planter with compatible plants. (V)

15. Have students run a house plant hospital for a day or week in school to identify house plant problems. (V)

16. Have students give a written diagnosis of the condition of their home lawn, list amount and times of fertilization, amount and frequency of watering, etc., and suggest improvements that should be taken. (VI)

EVALUATION - UNIT 7

	Suggested Methods	
Area of Evaluation	**Written**	**Performance**
1. Define Vocabulary Associated with Irrigation. (I)	X	
2. Identify Four Types of Irrigation Systems. (I)	X	
3. Explain Two Advantages and Disadvantages of: (I)		
a. Surface irrigation. (I)	X	
b. Sprinkler irrigation. (I)	X	
c. Subsurface irrigation. (I)	X	
d. Greenhouse irrigation. (I)	X	
4. Identify Three Basic Greenhouse Watering Systems (I)	X	
5. List Three Ways Water is Distributed By: (I)		
a. Surface irrigation. (I)	X	
b. Sprinkler irrigation. (I)	X	
6. Identify and Explain the Following Factors Determining Irrigation Requirements: (I)		
a. When to water. (I)	X	
b. How much water. (I)	X	
c. How to calculate water loss. (I)	X	
7. Identify and Explain the Following Methods of Determining Irrigation Requirements: (I)		
a. Measuring soil moisture - explain and demonstrate the following methods used: (I)	X	X
1. Feel method. (I)	X	X
2. Gravimetric method. (I)	X	X
3. Tensiometer method. (I)	X	X

(Cross references are made to sections of the Unit Outline.)

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EVALUATION (continued)

	Suggested Methods	
Area of Evaluation	Written	Performance
b. Water availability from meteorological data. (I)	X	
8. Explain the Formulation of a Consumptive-Use Index. (I)	X	
9. Identify the Major Factors Affecting Irrigation Efficiency. (I)	X	
10. Define Vocabulary Associated with Pruning. (II)	X	
11. Identify Four Reasons for Pruning. (II)	X	
12. Identify, Explain and Demonstrate Five Methods of Pruning: (II)		
a. Stem. (II)	X	X
b. Root. (II)	X	X
c. Heading-back. (II)	X	X
d. Thinning-out. (II)	X	X
e. Shearing. (II)	X	X
13. Identify, Explain and Demonstrate the Use of: (II)		
a. Pruning saws. (II)	X	X
b. Hand saws. (II)	X	X
c. Pole pruners. (II)	X	X
d. Hedge shears. (II)	X	X
e. Tools for repairing cabling and supporting. (II)	X	X

(Cross references are made to sections of the Unit Outline.)

EVALUATION (continued)

	Suggested Methods	
Area of Evaluation	Written	Performance
14. Identify the Proper Time to Prune: (II)	X	
a. Deciduous trees. (II)	X	
b. Deciduous shrubs. (II)	X	
c. Broadleaf evergreen shrubs. (II)	X	
d. Narrowleaf evergreen shrubs. (II)	X	
e. Fruit trees. (II)	X	
f. Small fruits. (II)	X	
g. Roses. (II)	X	
15. Explain the Difference Between: (II)		
a. Formal pruning. (II)	X	
b. Informal pruning. (II)	X	
16. Demonstrate Techniques for Removing Tree Limbs. (II)		X
17. Special Pruning: (II)		
a. Explain pruning to strengthen trunk and branches. (II)	X	
b. Explain pruning of young trees. (II)	X	
c. Define Espalier and Bonsai	X	
18. Pruning Fruit Trees: (II)		
a. Identify three training systems. (II)	X	
b. Explain the fruiting habits of the various species. (II)	X	
c. Explain the three stages of growth of maturing trees. (II)	X	

(Cross references are made to sections of the Unit Outline.)

EVALUATION (continued)

	Suggested Methods	
Area of Evaluation	**Written**	**Performance**
19. Pruning Small Fruits: (II)		
a. Explain the fruiting habits of grapes and brambleberries. (II)	X	
b. Identify four grape training systems. (II)	X	
c. Demonstrate pruning of small fruits.		X
20. Identify and demonstrate care of:		
a. Hybrid tea roses. (II)		X
b. Floribunda roses. (II)		X
c. Climbing roses. (II)		X
d. Tree roses. (II)		X
21. Explain and Demonstrate the Repair of Damaged Trees and Shrubs: (II)	X	X
a. Treating diseased areas on woody plants. (II)	X	X
b. Treating damaged bark. (II)	X	X
c. Cabling and supporting branches. (II)	X	X
22. Define Vocabulary Associated with Planting and Transplanting. (III)	X	
23. Explain the Proper Time of the Year to Plant: (III)	X	
a. Woody ornamentals. (III)	X	
b. Fruit trees. (III)	X	
c. Bulbs. (III)	X	
d. Perennial ground covers. (III)	X	
e. Perennial flowers. (III)	X	
f. Annual flowers. (III)	X	

(Cross references are made to sections of the Unit Outline.)

EVALUATION (continued)

	Suggested Methods	
Area of Evaluation	Written	Performance
24. Explain and Demonstrate the Requirements for Newly Planted Ornamentals: (III)	X	X
a. Fertilizer. (III)	X	X
b. Lime. (III)	X	X
c. Organic Matter. (III)		
d. Water. (III)	X	X
e. Protection. (III)	X	X
25. Explain and Demonstrate Techniques for Planting: (III)	X	X
a. Bare root stock. (III)	X	X
b. Balled and burlapped Stock. (III)	X	X
c. Containerized stock. (III)	X	X
26. Explain and Demonstrate Greenhouse Potting: (III)	X	X
a. Potting medias. (III) (See Core Unit 9, Section V)	X	
b. Potting seedlings. (III)	X	X
c. Potting rooted cuttings. (III)	X	X
d. Repotting. (III)	X	X
27. Explain Fertilizer Requirements for Newly Potted Crops. (III)	X	
28. Safe and Professional Work Habits.		X
29. Unit Notebook.	X	

(Cross references are made to sections of the Unit Outline.)

EVALUATION (continued)

		Suggested Methods	
	Area of Evaluation	Written	Performance
30.	Identify the Types of Growing Structures. (II A)	X	X
31.	Explain the Use of the Various Growing Structures. (II A)	X	
32.	Explain the Use of the Various Types of Greenhouses. (II B)	X	
33.	List the Parts of this Greenhouse. (II B)	X	
34.	List the Advantages and Disadvantages of: (II B)		
	a. Greenhouse structural materials.	X	
	b. Glazing materials.	X	
	c. Bench construction.	X	
	d. Bench layout.	X	
	e. Floor construction.	X	
35.	Explain the Need for Ventilation. (II B)	X	
36.	List Problems which may arise in Greenhouse Operation. (II B)	X	
37.	Identify and List Cultural Requirements for 30 houseplants. (V)		X
38.	Design and plant a terrarium dish garden or planter using compatible plants. (V)		X
39.	Explain and demonstrate proper fertilizing of houseplants. (V)		X
40.	Identify and control common house plant pests. (V)	X	X

EVALUATION (continued)

Area of Evaluation	Suggested Methods Written	 Performance
41. List steps and key points in establishing a home lawn from seed. (VI)	X	
42. List steps and key points in establishing a home lawn with sod. (VI)	X	
43. Explain advantages and disadvantages of sod vs. seed. (VI)	X	
44. Outline the procedure for caring for a home lawn properly. (VI)	X	X
45. Evaluate an established lawn and make suggestions for its improvement. (VI)	X	X

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All available from:
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Cook College, P.O. Box 231
New Brunswick, N.J. 08903

HORTICULTURE CORE ELEMENTS

UNIT 8

SMALL ENGINE POWER IN HORTICULTURE

PURPOSE:

The purpose of this unit is to provide the student with an understanding of the operation, maintenance and repair of farm and ornamental horticulture equipment. Students will obtain initial proficiencies for farm and related agricultural mechanics in areas that satisfy individual and community needs.

Est. Time Required: 4 - 5 wks.

SPECIFIC OBJECTIVES:

After completion of this unit, students will be able to:

1. Identify the components of a gasoline engine.
2. Identify the basic types of gasoline engines and explain the principles of operation.
3. Identify different types of fuel systems and their components.
4. Discuss ignition principles of gasoline engines.
5. Discuss combustion principles of internal combustion engines.
6. Describe and demonstrate the necessary adjustments to be made on spark plugs.
7. Identify different types of air cleaners.
8. Describe and demonstrate the necessary adjustments to be made on an air cleaner.
9. Identify different types of carburetors.
10. Describe and demonstrate the necessary adjustments to be made on a carburetor.
11. Select, maintain, and change crankcase oil in four stroke engines.
12. Maintain and explain the operations of engine cooling systems.
13. Develop and demonstrate a trouble shooting procedure.

SPECIFIC OBJECTIVES (continued)

14. Operate and adjust the two and four stroke engine to promote optimum efficiency and safety.

UNIT OUTLINE:

I. Gasoline Engine Nomenclature.

- A. Main Engine Components.
    1. Bearing plate.
    2. Cam gear.
    3. Cam shaft and plug.
    4. Connecting rod and oil slinger.
    5. Crankcase and cylinder. block.
    6. Crankcase breather.
    7. Crank shaft.
    8. Cylinder head.
    9. Engine base.
    10. Governor control lever.
    11. Governor control rod.
    12. Governor crank assembly.
    13. Governor lever assembly.
    14. Governor weight assembly and shaft.
    15. Main bearings.
    16. Piston, ring, and pin assembly.
    17. Reduction gear assembly.
    18. Spark advance weight and spring.
    19. Spark plug grounding switch.
    20. Tappet cover plate.
    21. Throttle link.
    22. Valves, springs, and keepers.
    23. Valve tappets.
- B. Air, Fuel, and Exhaust System Components.
    1. Air cleaner.
    2. Butterfly (choke and/or throttle).
    3. Carburetor lower body.
    4. Carburetor upper body.

UNIT OUTLINE (continued)

5. Choke lever.
6. Exhaust outlet and muffler.
7. Float.
8. Fuel tank.
9. Fuel tank outlet.
10. Idle adjustor screw.
11. Idle valve.
12. Needle valve.
13. Throttle.
14. Throttle lever.

C. Ignition System Components.

1. Battery.
2. Breaker base.
3. Breaker box cover and stop switch assembly.
4. Bearing plate.
5. Breaker points.
6. Breaker shaft.
7. Condenser.
8. Distributor.
9. Engine flywheel.
10. Flywheel housing.
11. Ignition coil.
12. Magneto.
13. Magneto armature.
14. Point gap adjusting cam.
15. Spark plug.

II. Combustion Principles of Internal Combustion Engines.

A. Essentials for Combustion.

1. Fuel.
2. Air.
3. Ignition.
4. Compression.

B. Basic Types of Gasoline Engines.

1. Two stroke.
2. Four stroke.

UNIT OUTLINE (continued)

III. Ignition Systems and their Components.

   A. Magneto Ignition.

      1. Breaker arm.
      2. Breaker points.
      3. Coil.
      4. Condenser.
      5. Flywheel.
      6. Frame laminations.
      7. Impulse coupling.
      8. Magnetic rotor.
      9. Spark plug.

   B. Magneto Ignition with Multiple Cylinders.

      1. Distributor rotor.
      2. Distributor gear.
      3. Distributor pinion.
      4. High-tension lead rod.

   C. Battery Ignition.

      1. Ignition coil.
      2. Condenser.
      3. Distribution system.

IV. Types of Carburetor Air Cleaners.

   A. Oil-Bath Type.
   B. Oiled Filter Type.
   C. Dry Filter Type.

V. Types of Carburetors and their Operation.

   A. Float Type Carburetor.
   B. Suction Type Carburetor.
   C. Diaphragm Type Carburetor.

UNIT OUTLINE (continued)

D. Principles of Carburetor Operation.
    1. Venturi principle.
    2. Air bleeding principle.
    3. Fuel and air mixtures.

E. Making Carburetor Adjustments.
    1. Idle speed screw.
    2. Low speed needle.
    3. High speed needle.

VI. Proper Lubrication.
    A. Importance of Proper Lubrication.
    B. Selecting Lubricants.
    C. Checking Crankcase Oil.
    D. Changing Crankcase Oil.

VII. Cooling Systems.
    A. Air-Cooled Engines.
    B. Water-Cooled Engines.

VIII. Trouble Shooting.
    A. Hard Starting.
        1. Faulty ignition.
        2. Faulty carburetion.
        3. Compression loss.
    B. Overheating.
    C. Backfiring.
    D. Poor Engine Performance.

UNIT OUTLINE (continued)

IX. Operating an Engine Properly.

   A. Using an Operator's Manual.

   B. Identifying Safety Precautions.

   C. Checking Required Servicing.

   D. Operating Within Specifications.

SUGGESTED ACTIVITIES: (Cross references are made to sections of the Unit Outline.)

1. Develop a display board with mounted engine parts. (I)

2. Distribute engine parts among students for identification. (I)

3. Have each student disassemble a small gasoline engine and identify and discuss each part. (I)

4. Use cutaway models of two-cycle and four-cycle engines to demonstrate the internal operating principles of each type. (II)

5. Use overhead transparencies, charts, diagrams, and mock-ups to discuss the principles involved in ignition systems of small engines. (III)

6. Have students disassemble ignition systems. (III)

7. Following an operator's manual, determine the proper setting for plugs and points and have students reassemble the dismantled ignition systems. (III, IX)

8. Have students prescribe necessary adjustments to be made for an ignition system. (III, VIII)

9. Describe fuel systems their functions and operations using overhead transparencies. (I)

10. Have students disassemble and adjust carburetors. (V)

11. Using different types of air cleaners, have students disassemble, prescribe and demonstrate necessary adjustments, and reassemble each type. (IV)

12. Demonstrate the effects of a dirty air cleaner on engine performance by partially blocking the air intake to the carburetor. (IV)

13. Change the oil in a four stroke cycle engine. (VI)

SUGGESTED ACTIVITIES (continued)

14. Use overhead transparencies to illustrate and identify the air flow in the engine cooling system. (VII)

15. Encourage students to bring in lawn mowers, riding tractors and farm tractors so that they may prescribe and demonstrate necessary adjustments to be made. This can become a FFA earning and savings activity and/or an individual SOE project. (III-VIII)

16. Encourage students to record their maintenance skills into the home and farm improvement section of their SOE record book. (III-VII)

17. Encourage students to pursue FFA small engine trouble shooting contests. (I-VIII)

18. Have students demonstrate machine operations. (IX)

19. Maintain agriculture department equipment; record a maintenance and operation log. (III-VIII)

20. Conduct a field trip to a business that makes wide use of farm and/or ornamental horticulture equipment.

EVALUATION - UNIT 8

Area of Evaluation	Suggested Method	
	Written	Performance
1. Gasoline Engines. (I, II)	X	
a. Identify different types. (II)	X	
b. Identify parts. (I)	X	
2. Fuel Systems. (I)	X	
a. Identify different types. (I)	X	
b. Identify parts. (I)	X	
3. Ignition Principles of Gasoline Engine. (I, III)	X	
4. Combustion Principles of Internal Combustion Engine. (II)	X	
5. Spark Plug Adjustments. (I, III)		X
6. Air Cleaners. (IV)	X	X
a. Identify different types. (IV)	X	
b. Adjustments. (IV)		X
7. Carburetor. (V)	X	X
a. Identify different types. (V)	X	
b. Adjustments. (V)		X
8. Crankcase Oil. (VI)		X
a. Selection of oil. (VI)		X
b. Maintenance of oil. (VI)		X
c. Changing oil in: (VI)		X
1. Small engines.		X
2. Riding tractor.		X
3. Farm tractor.		X

(Cross references are made to sections of the Unit Outline.)

EVALUATION (continued)

Area of Evaluation	Suggested Method	
	Written	Performance
9. Cooling Systems. (VII)	X	X
a. Explain operations. (VII)	X	X
b. Maintenance. (VII)		X
10. Two and Four Stroke Engines. (II, IX)		X
a. Operation. (II, IX)		X
b. Adjustments. (II, IX)		X
11. Develop and Follow Trouble Shooting Procedure. (VIII)		X
12. Safe and Professional Work Habits.		X
13. Unit Notebook.	X	

(Cross references are made to sections of the Unit Outline.)

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HORTICULTURE CORE ELEMENTS

UNIT 9

IDENTIFICATION AND CONTROL OF PLANT PROBLEMS

PURPOSE:

The purpose of this unit is to provide the student with a general knowledge of problems that affect plants. Specific emphasis will be placed on plant diseases, insect, vertebrate pests, weeds and other environmental disorders. Students will develop the ability to identify and safely control plant problems.

Est. Time Required: 3 wks.

SPECIFIC OBJECTIVES:

After completion of the unit, students will be able to:

1. Identify common insects and the damage they cause to horticultural crops.
2. Identify diseases that cause economic losses to horticultural crops.
3. Identify damage caused by vertebrates to horticultural crops.
4. Identify weeds that effect efficient production of horticultural crops.
5. Identify plant problems caused by environmental conditions.
6. Determine recommended cultural, biological, and chemical controls for plant problems.
7. Control environmental conditions detrimental to plant growth.
8. Design an integrated pest control program.

UNIT OUTLINE:

I. Identifying Insects and Mites.

   A. Identifying Characteristics.

      1. Body structure: head, thorax, abdomen.

      2. Wings.

      3. Legs.

      4. Antenna.

UNIT OUTLINE (continued)

5. Mouth parts.

B. Development and Life Cycle.

1. Complete metamorphosis.

2. Incomplete metamorphosis.

C. Insect and Mite Damage.

D. Identification of common insect pests.

E. Correlation of Control Applications to Stages of Life Cycle.

II. Identifying diseases.

A. Determine Disease Damage.

1. Visible disease symptoms.

a. Color.

b. Physical damage.

2. Parts of plant affected.

a. Foliage.

b. Stem.

c. Flowers and fruit.

d. Roots.

B. Determine Disease Causes.

1. Bacteria.

2. Fungi.

3. Viruses.

4. Nematodes.

C. Determine Favorable Conditions for Disease.

1. Air and soil temperature.

2. Humidity.

3. Moisture.

UNIT OUTLINE (continued)

4. General plant nutrition.

D. Determine Life Cycles of Disease Organisms and Correlation of Pevention Applications.

III. Identification and Control of Vertebrates.

A. Rodent Damage.

1. Rats.

2. Mice.

3. Ground squirrels.

4. Woodchucks.

5. Pocket gopher.

6. Rabbits.

7. Moles.

B. Bird Damage.

1. Crows.

2. Blackbirds.

3. Starlings.

C. Human Damage; Misuse of Machinery.

IV. Identifying and Controlling Weeds.

A. Economic Importance of Weed Control.

1. Reduction of crop yields.

2. Increase cost of production.

3. Reduction in crop quality.

4. Habitat for insects and disease.

B. Classifying Weeds.

1. Annuals.

2. Biennials.

3. Perennials.

UNIT OUTLINE (continued)

- C. Identifying Weeds.
    - 1. Leaf shape and leaf arrangement.
    - 2. Vegetative characteristics.
    - 3. Seed and flower.
- D. Student Participation in FFA Weed Identification Contest. (Local)
- E. Understanding Weed Reproduction.
    - 1. Seeds.
    - 2. Roots and bulbs.
    - 3. Stems: rhizomes, stolons, and tubers.
- F. Controlling Weed.
    - 1. Cultural practices.
    - 2. Chemical control.
- G. Applying Herbicides.
    - 1. Selection of a herbicide.
    - 2. Factors affecting application.
    - 3. Calibrating equipment.
    - 4. Safety of handling and application.

V. Recognizing Plant Problems Caused by Environmental Conditions.

- A. Mineral Deficiencies or Toxicities.
    - 1. Primary element deficiencies.
    - 2. Secondary element deficiencies.
    - 3. Minor element deficiencies.
    - 4. Compare sterile soil to nonsterile soil.
- B. Mechanical Injury.
    - 1. Improper machine usage.
    - 2. Improper plant handling.
- C. Chemical Injuries.

UNIT OUTLINE (continued)

1. Insecticide damage.
2. Herbicide damage.
3. Pollutant damage.

D. Climatic Injuries.

1. Amount and frequency of rainfall.
2. Heavy dews.
3. Relative humidity.
4. Air and soil temperature.

VI. Determine the Proper Control for Plant Problems.

A. Disease Resistant Varieties.

B. Seed Treatment.

C. Soil Treatment; Fumigation.

D. Crop Rotations.

E. Eliminate Pest Habitats.

F. Ranging and Quarantine Programs.

G. Applying Preventative Measures.

1. Use recommended chemicals.
2. Calibrate equipment.
3. Apply preventative measures for full coverage.
4. Follow label instructions for each chemical.
5. Record application rates and schedules.

H. Using Agricultural Extension Service.

VII. Alteration of the Plant Growth Environment as a Pest Control.

A. Plastic Mulches.

B. Biological Controls.

C. Physiological Manipulation.

1. Regulators.

2. Attractants.

3. Repellents.

D. Sanitation.

VIII. Using an Integrated Pest Control Program.

A. Employing Various Methods of Pest Control With Minimum Adverse Effects on the Ecosystem.

1. Cultural.

2. Biological.

3. Chemical.

SUGGESTED ACTIVITIES: (Cross references are made to sections of the Unit Outline.)

1. Have students make an insect collection. For each specimen students will complete a worksheet pertaining to the insects life cycle, feeding habits, identifying characteristics, etc. (I)

2. Study an enlarged model of an insect to become familiar with insect anatomy. (I)

3. Using a grasshopper, do a detailed study of insect anatomy. (I)

4. Encourage students to bring in insect pests. Keep students informed of local insect problems through general observation and County Extension Service pest reports. (I)

5. Using recommended pesticide listings, determine a proper control for various insect-crop problems. (I)

6. Practice insect control in the agricultural land laboratories. (I)

7. Using prepared specimens or slides of actual diseased material, learn to identify various disease forms. (II)

8. Have students consult with local Agricultural Extension Service reports on prevailing disease problems. Understand the environmental conditions in which the disease was initiated. Have students consider cultural controls before consulting recommended chemical applications. (II)

9. Apply disease controls in the agricultural land laboratory or greenhouse. (II)

10. Give students samples of plant problems and have them identify the causal agent and recommend a solution (I-VIII)

11. Show examples of vertebrate and mechanical damage to plants. (III)

12. Accumulate a collection of weeds, using the State FFA Weed Contest list as a guide. Emphasize local weed problems. Use the collection to identify weeds and to identify characteristics of weeds. (IV)

13. Study weeds around the schoolgrounds and determine the appropiate control for them. (IV)

14. Apply a herbicide; observe the results of the application. (IV)

15. In the greenhouse, compare sterile soil with nonsterile soil. (V)

16. Have students become familiar with local recommended herbicide applications. (IV)

17. Demonstrate herbicide damage and mineral toxicity on plants, comparing a controlled plant with a treated plant. (V)

18. Using tomato plants, compare a resistant tobacco mosaic to a non-resistant variety. (VI)

19. Encourage students to use recommended controls on SOE production projects. (VI)

20. Post appropriate rules of sanitation in greenhouses. Have students perform an inspection of unsanitary conditions in the greenhouse operation. (VII)

21. Use black plastic and other mulches in the school laboratory for weed control. (VIII)

22. Compare a biological control with a chemical control in the school laboratory, (VIII)

EVALUATION - UNIT 9

	Suggested Methods	
Area of Evaluation	Written	Performance
Given samples of insects the student will:		
1. Identify them and the damage they cause to horticultural crops. (I)	X	X
2. Identify diseases that cause economic losses to horticultural crops. (II)	X	X
3. Identify damage caused by vertebrates to horticultural crops. (III)	X	X
4. Identify weeds that affect efficient production of horticultural crops. (IV)	X	X
5. Identify plant problems caused by environmental conditions. (V)	X	X
a. Mineral deficiencies or toxicities. (V)	X	X
b. Mechanical injury. (V)	X	X
c. Chemical injury. (V)	X	X
d. Climatic injury. (V)	X	X
e. Sterile soil vs. nonsterile soil. (V)	X	
6. Recommend control measures to alter environmental conditions detrimental to plant growth. (V-VI)	X	X
7. Determine recommended controls for plant pest problems. (VI-VIII)	X X	X X
a. Biological controls. (VI-VIII)	X	X
b. Chemical controls. (VI-VIII)	X	X
c. Cultural controls. (VI-VIII)	X	X
d. Using Agricultural Extension Service Bulletins (VI)		
8. Have students interpret pesticide labels to determine: (VI)	X	X
a. Pest(s) to be controlled. (VI)	X	X
b. Application rate. (VI)	X	X
9. Calibrate a sprayer. (VI)		X

Evaluation (continued)

Area of Evaluation	Suggested Methods	
	Written	Performance
10. Have students interpret herbicide labels to determine: (IV, VI)	X	X
a. Weeds to be controlled (IV)	X	X
b. Application rate. (VI)	X	X
11. Explain the use of an integrated pest management control program. (VIII)	X	
12. Safe and professional work habits.		X
13. Unit notebook	X	

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HORTICULTURE CORE ELEMENTS

UNIT 10

SAFE APPLICATION OF HORTICULTURAL CHEMICALS

PURPOSE:

The purpose of this unit is to provide the student with a knowledge and understanding of safe chemical applications in horticulture with emphasis being placed on the development of initial proficiencies.

Est. Time Required: 3 weeks.

SPECIFIC OBJECTIVES:

After the completion of this unit, students will be able to:

1. Identify plant pests.
2. Identify nutritional needs of plants.
3. Discuss the general characteristics of horticultural chemicals.
4. Read and explain pesticide labels.
5. Observe safety precautions in selecting, handling, using, storing and disposing of pesticides.
6. Select appropriate pesticide and fertilizer application equipment.
7. Calibrate pesticide and fertilizer application equipment.
8. Mix and load pesticide and fertilizer application equipment.
9. Operate equipment effectively and safely.
10. Maintain and store application equipment.

UNIT OUTLINE:

I. Pest Identification.

  A. Identifying Insects.

    1. Boring insects.
    2. Chewing insects.
    3. Soil borne insects.
    4. Sucking insects.

UNIT OUTLINE (continued)

B. Identifying (Causes of) Plant Disease.

1. Bacterial related.

2. Fungal related.

3. Viral related.

II. Nutritional Deficiencies of Plants.

A. Fertilizer Element Deficiencies.

1. Nitrogen deficiencies.

2. Phosphorus deficiencies.

3. Potassium deficiencies.

4. Secondary and minor element deficiencies.

B. Lime Deficiencies.

1. pH requirements.

2. Calcium and magnesium deficiencies.

III. Physical Characteristics of Agricultural Chemicals.

A. Pesticides Come in Various Forms.

1. Liquid formulations.

a. Aerosol.

b. Emulsifiable concentrate.

c. Flowable.

d. Fumigant.

e. Solution.

2. Dry formulations.

a. Baits.

b. Dusts.

C. Granules.

d. Soluble powder.

e. Wettable powders.

B. Types of Pesticides.

1. Contact.

2. Non-selective.

3. Pre-emergence.

4. Selective

UNIT OUTLINE (continued)

        5. Post emergence.
        6. Systemic.
    C. Fertilizer and Lime Forms.
        1. Granular forms.
        2. Liquid forms.
        3. Pellet forms.

IV. The Pesticide Label.
    A. Classification by Use.
        1. General use.
        2. Restricted use.
    B. Brand Name.
    C. Common Name.
    D. Chemical Name.
    E. Formulation.
    F. Signal Words.
        1. Caution.
        2. Danger.
        3. Warning.
    G. Hazard Statement.
    H. First Aid Measures.
    I. Re-entry Statement.
    J. Directions for Use.
        1. Control of pests.
        2. Conditions for use.
        3. Equipment to use.
        4. Environmental restrictions.
        5. Time application.
        6. Storage and disposal of pesticides and containers.

V. Fertilizer Label.
    A. Type.
    B. Weight.
    C. Formulation

UNIT OUTLINE (continued)

D. Hazard Statement

E. Directions for Use.

1. Specific crops.

2. Conditions.

3. Equipment.

4. Time of application.

5. Storage and disposal.

VI. Safety Precautions.

A. Wearing Protective Clothing and Other Devices.

1. Coveralls, raincoats, and aprons.

2. Hats, boots, and gloves.

3. Goggles and face shields.

4. Respirators.

a. Cannister.

b. Cartridge.

VII. Selecting Application Equipment.

A. Pesticide Application.

1. Farm and ranch.

a. Low pressure boom.

b. Air-blast.

c. High pressure.

2. Greenhouse and grounds.

a. Aerosol and fog.

b. Compressed air.

c. Dusters.

d. Fumigant applicators.

e. Hose attachments.

f. Trombone type.

B. Fertilizer and Lime Application.

1. Farm and ranch.

a. Broadcast and drilling.

b. Liquid application.

UNIT OUTLINE (continued)

      c. Fumigant applicators.
      d. Side dressing.
   2. Greenhouse and Grounds.
      a. Chapin system.
      b. Drop and cyclone spreaders.
      c. Hozon and Gewa.

VIII. Calibration.
   A. Area-Volume Method.
   B. Time Volume Method.

IX. Mixing and Loading.
   A. Liquid Emulsions.
   B. Wettable Powders.
      1. Procedures for mixing safely.
      2. Procedures for loading safely.

X. Operating Equipment.
   A. Manually Operated Applicators.
   B. Low Pressure Applicators.
   C. High Pressure Applicators.
   D. Air Blast Applicators.
      1. Controls.
      2. Adjustments.
      3. Type of material.
      4. Environmental conditions.
      5. Calibration.

XI. Maintenance and Storage.
   A. Cleaning Equipment.
      1. Wettable powders and emulsifiable concentrates.
      2. Herbicides.
   B. Preparing for Storage.
      1. Pump maintenance.
      2. Tanks and strainers.
      3. Hoses.
      4. Nozzles.

SUGGESTED ACTIVITIES: (Cross references are made to sections of the Unit Outline.)

1. Have students collect and mount insect pests of economic importance and compile information concerning time and method of control. (I)
2. Show examples of plant diseases and determine the causal agent, noting the prevention of the organism. (I)
3. Show examples of nutritional deficiencies using pictures or live samples. Explain the use of nutritional deficiency keys. (II)
4. Test for pH to determine the amounts of lime to be used as a soil supplement. (II)
5. Show students the different pesticide and fertilizer forms. Compare wettable powders and emulsifiable concentrates in solution. (III)
6. Give students practice exercises that deal with important facts concerning pesticide and fertilizer labels. (IV, V)
7. Establish a pesticide area for department pesticides. (IV)
8. Demonstrate safe pesticide application apparel using a student as the model. (V)
9. After demonstrating the proper technique, have students apply pesticide materials in the greenhouse and on school grounds.
10. Calibrate fertilizer spreaders in the shop on a piece of measured plastic. Weigh the material distributed. (VIII)
11. Calibrate a boom sprayer filled with water. Measure the amount dispersed over a measured area at a specific speed and pressure. (VIII)
12. Demonstrate the different spray nozzle patterns and the importance of proper adjustment. (VIII)
13. Mix and load a sprayer and apply a herbicide on school grounds. (I, XI)
14. Mix and load a sprayer with a disease prevention or insect control chemical and have students apply it to ornamentals on the school grounds. (I, XI)
15. Have students record pesticide activities in a log. (I, XI)
16. Have students take the State Pesticide Exam for a core license. (I, XI)
17. Demonstrate the proper cleaning of equipment, disposal of unused pesticide materials and containers and the safe storage of chemicals. (XI)
18. Encourage students to use equipment and materials for SOE projects when a competent standard has been achieved. (I, XI)
19. Encourage students to repair and maintain farm and home application equipment in the agricultural shop. (X, XI)

EVALUATION - UNIT 10

Area of Evaluation	Suggested Methods: Written	Suggested Methods: Performance
1. Identify Plant Pests. (I)	X	X
2. Identify Nutritional Needs of Plants. (II)	X	X
3. Discuss the General Characteristics of Agricultural Chemicals. (III)	X	
4. Read and Explain Pesticide Labels. (IV)		X
5. Read and Explain Fertilizer Labels. (V)		X
6. Observe Safety Precautions in: (VI)		X
a. Selecting appropriate pesticides. (VI)		X
b. Handling pesticides. (VI)		X
c. Using Pesticides. (VI)		X
d. Storing pesticides. (VI)		X
7. Select Appropriate Equipment for: (VII)		X
a. Fertilizer application. (VII)		X
b. Pesticide application. (VII)		X
8. Calibration Using the: (VIII)		X
a. Area-volume method. (VIII)		X
b. Time-volume method. (VIII)		X
9. Mixing and Loading: (IX)		X
a. Liquid emulsions. (IX)		X
b. Wettable powders. (VIII)		X
10. Safe and Effective Operation of Equipment. (X)		X
11. Proper Maintenance and Storage of Equipment. (X)		X
12. State Pesticide Core Exam. (I-XI)	X	
13. Safe and Professional Work Habits.		X
14. Unit Notebook.	X	

(Cross references are made to sections of the Unit Outline.)

SUGGESTED REFERENCES

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HORTICULTURE CORE ELEMENTS

UNIT 11

HORTICULTURAL BUSINESS MANAGEMENT

PURPOSE:

The purpose of this unit is to provide the students with the information and learning activities necessary to develop a foundation in understanding the establishment and operation of a horticultural business.

Est. Time Required: 2 - 3 wks.

SPECIFIC OBJECTIVES: After completion of this unit, students will be able to:

1. Identify the horticultural goods and services for which there is a demand and potential market in the students' local community and regional area.
2. Identify the factors to be considered in selecting the best location to begin a horticultural business.
3. Identify local laws affecting a newly established horticultural business.
4. Explain the organization of a single proprietorship, partnership, and a corporation, and outline the advantages and disadvantages of each.
5. Using a horticultural enterprise of their choice, list the land, buildings, supplies, tools, equipment, and capital needed for business start-up.
6. Recognize the need for proper financing and list the sources available to a new horticultural business.
7. Calculate interest rates and costs for borrowed money.
8. Develop sample production and cropping schedules to meet a given demand.
9. Identify major holidays and/or seasons and the horticultural goods and services needed.
10. Explain the entry level employment qualifications necessary for horticultural jobs.

SPECIFIC OBJECTIVES (continued)

11. Identify the need for seasonal labor required by the various horticultural businesses.

12. Identify the advantages of incentive based pay as compared to hourly pay for production workers.

13. Using a given horticultural enterprise, demonstrate an understanding of the procedure and mathematics for estimating and/or bidding the cost of supplies and services for a job.

14. Explain the importance of accurate inventory control as a contributing factor to profitable business management.

15. List the preparatory marketing steps necessary before harvesting horticultural crops.

16. Demonstrate an understanding of the commercial methods for packaging and/or handling horticultural commodities.

17. Explain the facilities needed to store horticultural crops before marketing.

18. Fill out a sample record book correctly using a hypothetical monthly business report for a horticultural business.

19. Identify markets available in the local and regional area.

20. Demonstrate an understanding of the grades and standards that apply to the various horticultural crops.

21. Explain the transportation options available to horticultural businesses to ship and/or deliver their products.

22. Identify the various media available to advertise goods and services.

23. Using a horticultural enterprise of their choice, create a display promoting a product or service.

24. Demonstrate an understanding of the mark-up procedures used to price various horticultural products.

25. Demonstrate an understanding of the basic techniques of good salesmanship.

26. Explain the use and value of basic business machines, including computers.

27. Demonstrate an understanding of billing procedures.

SPECIFIC OBJECTIVES (continued)

28. Demonstrate an ability to take a telephone order.
29. Identify the types of records that business should or are required to keep.
30. Demonstrate an understanding of the preparation of a return-on-investment statement.
31. Demonstrate an understanding of basic financial record keeping.

UNIT OUTLINE

I. Establishing a Horticulture Business

   A. Goods and Services.

      1. Plants.
      2. Floral Decorations.
      3. Landscape Services.
      4. Fruits and Vegetables.

   B. Locating the Business.

      1. Potential Customers.
      2. Existing Competition.
      3. Available Site.
      4. Labor Supply.
      5. Local Business Laws.

   C. Business Structure.

      1. Single Proprietorship.
      2. Partnership.
      3. Corporation.

   D. Capitalization.

      1. Land, Buildings, Supplies, Tools and Equipment.
      2. Start-up Costs.
      3. Initial Operating Costs.

UNIT OUTLINE (continued)

        4. Borrowing Money.

II. Business Operation.

    A. Production Scheduling.

        1. Sales Demand.
        2. Seasons or Holidays.
        3. Weather.
        4. Labor.
        5. Inventory Control.
        6. Bidding and Estimating.

    B. Harvesting.

        1. Nursery Crops.
        2. Floriculture Crops.
        3. Fruits.
        4. Vegetables.
        5. Packing.
        6. Storage and Refrigeration.

    C. Marketing and Merchandising.

        1. Types of Markets.
        2. Grades and Standards.
        3. Transportation.
        4. Advertising.
        5. Display.
        6. Pricing.
        7. Merchandising.
        8. Salesmanship.
        9. Business Machine Operation.
        10. Use of the Telephone.
        11. Billing and Invoicing.
        12. Asthetics.
        13. Use of the Computer.

UNIT OUTLINE (continued)

D. Record Keeping.

1. Production Records.
2. Pesticide Application.
3. Labor Records.
4. Cash Flow.
5. Return on Investment.
6. Debits and Credits.
7. Inventory.
8. Tax Records.
9. Networth.

SUGGESTED ACTIVITIES: (Cross references are made to sections of the Unit Outline.)

1. Have the students select a horticultural enterprise of their choice and develop a plan (to include structures, layout, markets, finance, equipment, education, etc.) to establish the business. (I)
2. Invite a lawyer to speak to the class on the laws affecting new businesses. (I)
3. Invite a banker to speak to the class on financing options available to young business persons. (I)
4. Have the students select a horticultural enterprise of their choice and develop a plan to show the cost estimating and/or bidding and planning necessary to produce, harvest and market the product. (II)
5. Have the students keep up to date and accurate records on their SOEP agricultural business project. (II)
6. Have students survey the community and determine the possibilities of marketing various types of horticultural products. (II)
7. Have the students draw up an advertising layout to be used in promoting a horticultural product produced in the horticultural program. (II)
8. Take a field trip to visit various horticultural businesses when their product is being produced and/or harvested. (II)
9. Invite an accountant to speak to students on the importance of good record keeping. (II)
10. Invite horticulture business owners to talk to students about entry level employment in their business.
11. Have students do worksheet titled "Location of a Florist Shop: Analysis."

Business Management
Location of a Florist Shop: Analysis

The following is a description of three different communities which you are considering for your shop. Using the given information, determine which location will be the most profitable. Complete the worksheet and show your work. In the end you should make your decision based on the cost of rent in the community compared to the amount you can afford to spend on rent. (Remember rent will average 3.5% of your shop's gross income.)

Community #1:

This is a suburban area of mainly upper middle-class families. They have diverse occupations but many are professionals such as doctors, lawyers, professors and business executives. The average family income is $27,000/year. Each family spends approximately 1/3 of this in the community. There are 3 florist shops in the area at the present time. You have a choice of 2 buildings: one in the business district at $375.00/month and the other at a shopping mall for $400/month. Population is 46,000 with an average family size of 4 equals 11,500 families in this community.

Community #2:

This rural community of 6,800 people is based totally on agricultural production. The average income of a family is $12,000/year. As in most small towns, most of their income is spent in the community (2/3). At the present there is 1 florist with a small greenhouse in town. It is a family business and they have been here over 25 years. The building which is available is located on Main Street and is in good repair. The rent is $165.00 per month.

Community #3:

This is a semi-rural community with a population of 38,200. The industries are mainly farming, fertilizer production and a paper products factory. There is a new power plant being built in the vicinity. The average family income is $18,000/year and 1/2 of this comes back to the area businesses. There are 2 retail florists in town and 1 green plant store. You are looking at one building downtown with little parking space for $300/month.

Which community is going to be most profitable? Explain.

Least profitable? Why?

Reference: Retail Flower Shop Operation & Management. Richard F. Stinson et al. University Park, PA: Pennsylvania State University College of Agriculture, 1986.

FLORAL DESIGN WORKSHEET

Name ______________________

	#1 Suburb	#2 Rural	#3 Semi-rural
No. of families	11,500	1,700	9,550
$ spent/family in community/yr.	$ 8,991	$8,000	$ 9,000
Total sales of area businesses/yr.	________	________	________
Amount on flowers/yr.	________	________	________
Gross income of each Florist Shop	________	________	________
Money available for rent/yr.	________	________	________
Money available for rent/month	________	________	________

Comparison:

BUSINESS MANAGEMENT WORKSHEET

Name Key

	#1 Suburb	#2 Rural	#3 Semi-rural
No. of families	11,500	1700	9,550
$ spent/family in community/yr.	8,991	$8,000	$ 9,000
Total sales of area businesses/yr.	$103,396,500	$13,600,000	$85,950,000
Amount of flowers/yr.	516,982	68,000	429,750
Gross income of each Florist Shop	129,246	34,000	122,786
Money available for rent/year	4,524	1,190	4,298
Money available for rent/month	377	99	358
Comparison: *			
Salary 25%	32,311	8,500	30,697
Merchandise 35%	42,235	11,900	42,975
Overhead 25%	32,311	8,500	30,697
Miscellaneous 5%	6,462	1,700	6,139
Profit 10%	12,924	3,400	12,279

*See Retail Floristry Reference.

EVALUATION - UNIT II

	Suggested Methods	
Area of Evaluation	**Written**	**Performance**
1. Identify Horticultural Goods and Services for Which There is a Market in: (I)		
a. Local area. (I)	X	
b. Regional area. (I)	X	
2. Identify the Factors in Locating a Business. (I)	X	
3. Identify Local Laws Affecting Newly Established Horticultural Businesses. (I)	X	
4. Explain the Organization of:		
a. Proprietorship. (I)	X	
b. Partnership. (I)	X	
c. Corporation. (I)	X	
5. Using a Specific Horticultural Enterprise, List the Following Start-Up Requirements: (I)		
a. Land (I)	X	
b. Buildings. (I)	X	
c. Supplies. (I)	X	
d. Tools.. (I)	X	
e. Equipment. (I)	X	
f. Capital. (I)	X	
6. List the Sources of Business Credit Available. (I)	X	
7. Calculate Interest Rates for Borrowed Money. (I)	X	
8. Develop Sample Production and Cropping Schedules. (II)	X	
9. Identify Major Holidays and the Horticultural Goods and Services Needed. (II)	X	

Evaluation (continued)

	Suggested Methods	
Area of Evaluation	**Written**	**Performance**
10. Explain the Entry Level Employment Qualifications for Horticultural Jobs. (II)	X	
11. Explain the Need for Seasonal Labor. (II)	X	
12. Explain the Advantages of Incentive Based Pay Versus Straight Hourly Pay. (II)	X	
13. Using a Specific Horticultural Enterprise, Explain the Procedure and Mathematics for Estimating and/or Bidding the Cost of Supplies and Services. (II)	X	X
14. Explain the Importance of Accurate Inventory Control. (II)	X	
15. List the Preparatory Steps Before Harvesting a Horticultural Crop. (II)	X	
16. Explain the Major Considerations In Havesting, Packing and Storing: (II)	X	
a. Nursery Crops. (II)	X	
b. Floriculture Crops. (II)	X	
c. Fruits. (II)	X	
d. Vegetables. (II)	X	
17. Identify Local Markets. (II)	X	
18. Explain the Grading of Horticultural Commodities. (II)	X	
19. List Transportation Options and Considerations Available to Horticultural Businesses. (II)	X	
20. Demonstrate an Understanding of the Following Business Skills: (II)	X	
a. Advertising. (II)	X	X
b. Pricing. (II)	X	X
c. Salesmanship. (II)	X	X

Evaluation (continued)

Area of Evaluation	Suggested Methods	
	Written	Performance
d. Merchandising. (II)	X	X
e. Business Machine Operation. (II)	X	X
f. Use of the Telephone. (II)	X	X
g. Billing and Invoicing. (II)	X	X
21. Explain the Need for the Following Records: (II)		
a. Production. (II)	X	
b. Pesticide Application. (II)	X	
c. Debits and Credits. (II)	X	
d. Inventory. (II)	X	
e. Tax Records. (II)	X	
22. Explain the Importance of:		
a. Cash Flow Statement. (II)	X	
b. Return on Investment. (II)	X	
c. Net Worth. (II)	X	

(Cross references are made to sections of the Unit Outline).

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ARBORICULTURE

PURPOSE

SPECIFIC OBJECTIVES

OUTLINE

I. IDENTIFY JOB OPPORTUNITIES

II. DIGGING AND TRANSPLANTING MATURE TREES AND SHRUBS

III. PRUNING MATURE TREES AND SHRUBS

IV. REMOVAL OF OLD, DISEASED AND STORM DAMAGED MATERIALS

V. REPAIRING MATURE PLANT MATERIALS

VI. IDENTIFICATION AND CONTROL OF PESTS

VII. CULTURAL REQUIREMENTS OF TREES AND SHRUBS

VIII. BUSINESS CONSIDERATIONS FOR THE ARBORIST

SUGGESTED ACTIVITIES

EVALUATION

REFERENCES

HORTICULTURE #1

ARBORICULTURE

PURPOSE:

The purpose of this unit is to provide the student with the theories and skills necessary to develop job entry skills into arboriculture occupations. The student will use newly learned theories and skills and apply them to entry into two-year programs for advanced arboriculture training. Arboriculture is the study and culture of trees.

SPECIFIC OBJECTIVES:

After the completion of this unit, students will be able to:

1. Identify occupational opportunities in the arboriculture field.
2. Dig and transplant large trees and shrubs.
3. Prune mature trees and shrubs.
4. Safely cull of mature trees and shrubs.
5. Shape and repair trees and shrubs.
6. Identify tree and shrub pests.
7. Control pests in mature trees and shrubs.
8. Root prune trees and shrubs.
9. Recognize nutritional deficiencies.
10. Explain and demonstrate methods of applying fertilizer to trees and shrubs.
11. Demonstrate and explain preventative measures to take to protect trees and shrubs from injuries.
12. Understand the business aspects of the arboriculture occupation.

UNIT OUTLINE:

- I. Identify Job Opportunities
  - A. Tree planter
  - B. Tree sprayer
  - C. Tree pruner
  - D. Tree surgeon aide
  - E. Tree surgeon
    - 1. Occupational opportunities
    - 2. Educational requirements
    - 3. Competencies required
- II. Digging and Transplanting Mature Trees and Shrubs
  - A. Identification of plant materials
    - 1. Deciduous trees and shrubs
    - 2. Evergreen trees and shrubs
      - a. Needled and conifer
      - b. Broadleaf
  - B. Understanding tree and shrub growth requirements (Core: General Knowledge of Plants)
  - C. Understanding tree root systems
  - D. Operating and maintaining power equipment safely (Core: Power)
    - 1. Using power augers
    - 2. Using power spades
      - a. Digging and balling trees
      - b. Digging bare root trees
      - c. Preparing holes for transplanting
  - E. Planting trees

- F. Bracing trees
- G. Watering trees

III. Pruning Mature Trees and Shrubs

- A. Understanding tree growth habits on pruning operations
- B. Using climbing equipment safely
  - 1. Handling ladders
  - 2. Climbing trees
  - 3. Using power hoisting equipment safely
- C. Selecting and using pruning equipment
  - 1. Using hand pruning tools
    - a. Saws
    - b. Shears
  - 2. Safe operation of power equipment safely in tree and shrub maintenance
    - a. Chain saws and power shears
    - b. Hydraulic pruners
- D. Maintaining pruning tools and equipment
  - 1. Sharpening
  - 2. Adjusting
  - 3. Lubrication
  - 4. Storage
- E. Pruning trees
  - 1. Pruning cuts
    - a. Under one inch in diameter
    - b. Over one inch in diameter
  - 2. Pruning systems
    - a. Central leader system
    - b. Open center system
    - c. Modified leader system
    - d. Espaliering

            - e. Cordon
            - f. Pleaching
            - g. Pollarding
            - h. Topiary
            - i. Thinning
            - j. Heading back
            - k. Shearing
        - 3. Proper time of pruning
            - a. Evergreen and conifers
            - b. Deciduous
                - (1) Spring flowering shrubs
                - (2) Summer and fall flowering shrubs
        - 4. Treating pruned surfaces
        - 5. Handling, removing and disposing of pruned materials
            - a. Safe use of power wood chipper

- IV. Removal of Old, Diseased and Storm Damaged Materials
    - A. Felling trees
        - 1. Preparing area for safety
        - 2. Determine and prepare drop area
        - 3. Selecting proper equipment
        - 4. Safety procedures
        - 5. Primary notch cut
        - 6. Final cut
    - B. Bucking limbs
        - 1. Kinds of power saws
        - 2. Safe use of power saws

3. Proper dress and safe work habits
4. First aid procedures for accidents

V. Repairing Mature Plant Material
   A. Supporting and bracing limbs
   B. Cleaning and treating cavities and splits
   C. Wrapping tree trunks
   D. Bridge grafting

VI. Identification and Control of Pests (Core: Soil and Horticulture Practices)
   A. Insects
      1. Chewing
      2. Sucking
      3. Boring
      4. Rasping
   B. Diseases
      1. Bacterial
      2. Fungus
      3. Virus
   C. Selecting the proper pesticide
   D. Determining coverage and coverage requirements
   E. Preparing pesticide solutions
   F. Adjusting and operating sprayers
   G. Cleaning and repairing sprayers
   H. Spraying a prescribed area safely

VII. Cultural Requirements of Trees and Shrubs
   A. Pruning root systems
   B. Fertilizing
      1. Recognizing nutritional deficiencies
      2. Foliar fertilizing
      3. Pipe method of fertilizing

C. Preventing injury to trees and shrubs

   1. Mechanical injury

   2. Damage caused by rodents and deer

   3. Water injury

VIII. Business Considerations for the Arborist (Core: Business Management)

A. Pricing jobs

B. Understanding the arborist's legal responsibilities

   1. Pesticide liability

   2. Property liability

C. Pricing replacement materials due to environmental and mechanical damage

SUGGESTED ACTIVITIES:

1. Review advertisements in trade magazines for job opportunities; refer to specific horticulture career information through a computer service system: GIS, Guidance Information System and CIDS, Career Information Delivery System.

2. Visit and tour arboretums: Longwood Gardens, Reeves, Reed, and Freylingh Morris Arboretum; request a tour which takes the students "behind the scene" to see the working conditions of an arboretum.

3. Plan to attend the annual meeting of the New Jersey Shade Tree Federation and Extension Service sponsored programs for arborists.

4. Subscribe to literature from the New Jersey Shade Tree Federation, Arborists Association of New Jersey, and the International Society of Arboriculture.

5. It is strongly suggested that a tractor with PTO powered auger be available for instructional use. Prepare planting holes with the power auger. Take advantage of tree planting jobs in the local community, specifically, cooperating with the local shade tree commission. Be aware of areas on school grounds where trees of 2-2-1/2" caliber, 12 to 14

feet in height and B&B/bareroot can be planted. Trees can be obtained from the County Shade Tree Commission Nursery. Trees can also be obtained through local school budgets if organized, well planned proposals are presented, stressing: units of instruction, beautification of school grounds and the development of a school arboretum. The development of a master arboretum plan would insure new specimens ordered and planted each year. Local nurserymen, Shade Tree commission, county agent, extension specialist in arboriculture activities are available to develop a school arboretum plan. (II)

6. Take advantage of Vermeer Tree spade operations in the community, especially in local nursery operations. (II)

7. Using students' home grounds, the school grounds, vo-ag plant material laboratories and other community opportunities, demonstrate the use of basic pruning tools, emphasizing the use of pole saws and pruners. (III)

8. Take advantage of local or transient community contracted tree surgeons for the demonstration of hydraulic hoists and pruners and wood chippers.

9. Demonstrate and supervise capable students in the use of chain saws. (III)

10. A woodlot laboratory is essential to practice culling activities, essential pruning activities, removal of dead and storm damaged limbs, wound care, and cabling. (III)

11. Select a wall or fence on the school building, preferably associated with agriculture complex, and espalier a plant species; suggested species are: Firethorne, Pyracantha, coccinea lalandi, crabapple, Malus theifera (hupehensis), and Cedar, Cedrus deodara kashmir. (Also topiary) (III)

12. Expose students to annual arborist's field days, promoted by the Agriculture Extension Service; such field days will expose students to climbing equipment hydraulic hoisting and pruning tools. (III)

13. Using the agriculture arboretum, demonstrate and have students perform pruning techniques. (III)

14. Using the agriculture woodlot, demonstrate culling and removal of cull trees with a chain saw. (IV)

15. Have students assist in developing departmental visual aids by obtaining samples of the following:

    (1) Split tree trunk, mend with bolt, washers, and nuts passing through split trunk.

    (2) Forked crotch, adapt cable system to simulate repair of split crotch.

    (3) Three lateral, showing a proper pruning cut. (V)

16. Using the agriculture arboretum and woodlot laboratories, have students systematically diagnose insect and disease problems. Promote the use of insect and disease handbooks. After diagnosis, students should recommend controls and when practical, apply controls. (VI)

17. Give students practical experiences in preparing and applying pesticides with power mist sprayers and 15 gallon, 5 GPM centrifugal pump power sprayers. Expose students to the operation of commercial mist sprayers through a visit to a local fruit or vegetable farmer. VI

18. Using the agriculture department arboretum, have students perform fertilization practices, determining rate of application and application. Students should apply granular insecticides according to recommendations. VI

19. Students should become familiar with trade newsletters. The Extension Service weekly insect-disease update is an excellent teaching resource for this activity. (VI)

20. Have students, using proper resources, develop a cost estimate for storm damaged materials. (VIII)

21. Encourage interested students to apply for two year post high school curriculums in arboriculture. Encourage students to apply for jobs with local tree surgeons. (I-VIII)

22. Students should keep records in SOEP record books on arboriculture skill activities and apply for State FFA Proficiency Awards where applicable. (I-VIII)

EVALUATION

	Suggested Method	
Area of Evaluation	Written	Performance
1. Identify occupational opportunities in the arboriculture field. (I)	X	
2. Dig and transplant large trees and shrubs. (II)	X	X
3. Prune mature trees and shrubs. (III)	X	X
4. Safely culling of mature trees and shrubs. (IV)		X
5. Shape and repair trees and shrubs. (V)		X
6. Identify tree and shrub pests. (VI)	X	X
7. Control pests in mature trees and shrubs. (VI)	X	
8. Root prune trees and shrubs. (VII)		X
9. Recognize nutritional deficiencies. (VII)	X	X
10. Explain and demonstrate methods of applying fertilizer to trees and shrubs. (VII)	X	X
11. Demonstrate and explain preventative measures to take to protect trees and shrubs from injuries. (VII)	X	X
12. Understand the business aspects of the arboriculture occupation. (VIII)	X	

SUGGESTED TEXTS:

Pruning Handbook, Sunset Books and Sunset Magazine, Lane Publishing Co., Menlo Park, CA, 1976.

Chain Saw Technician Workbook, Ken Cook Educational Systems, Division of Ken Cook Co., 12855 W. Silver Spring Drive, P.O. box 207, Butler, WI 53007.

A Field Guide to Trees and Shrubs, George A. Petrides, 2nd Edition, Houghton Mifflin Company, Boston.

REFERENCES:

Diseases of Shade Trees, Terry A. Tattar, Academic Press, Oak Tree Road, Palisades, NY 10964, 1978.

Field and Laboratory Guide to Tree Pathology, Robert O. Blanchard, Terry A. Tattar, Academic Press, Oak Tree Road, Palisades, NY 10964, 1981.

Trees, Shrubs and Vines, Arthur T. Viertel, Syracuse University Press, 1982.

Insects That Feed On Trees and Shrubs, Warren T. Johnson and Howard H. Lyon, Comstock Publishing Associates, Cornell University Press, 124 Roberts Place, Ithaca, NY 14850, 1982.

American Standard for Nursery Stock, American Association of Nurserymen, 230 Southern Building, Washington, DC 20005.

American National Standard, ANS1Z133.1-198. American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

Guide for Establishing Values of Trees and Other Plants, International Society of Arboriculture, P.O. Box 71, 5 Lincoln Square, Urbana, IL 61801.

Pesticides for New Jersey, 1985, County Agriculture Extension Service.

Concentrated Spray Equipment, Samuel Frederick Potts, Dorland Books, Caldwell, NJ.

PERIODICALS:

American Nurseryman, American Nurseryman Publishing Co., 310 S. Michigan Avenue, Suite 302, Chicago, IL 60604.

Grounds Maintenance, Intertec Publishing Corp., 9221 Quivira Rd., Overland Park, KS 66215.

Weeds, Trees and Turf, Harcourt Brace Jovanovich Publications, 7500 Old Oak Boulevard, Cleveland, Ohio 44130

AUDIO VISUAL:

Safety in Operating Power Chain Saws
C10124P, slides

Controlling Pests of Ornamental Plants
C10431P, filmstrip and cassette

Understanding and Safe Use of Pesticides
C10516P, filmstrip

Calibrating and Applying Pesticides Safely
C10517P, filmstrip

Tree Identification
C10412P, slides

Elements of Pruning
C10450P, filmstrip and cassette

Pruning Evergreens
C10273P, filmstrip

Pruning Deciduous Shrubs
C10274P, filmstrip

Pruning Flowering Trees
C10275P, filmstrip

Hand Digging of Trees and Shrubs
C10509P

Types of Grafting Slide sets
C10153P, slides

Major Pruning Trees
C1056JP, filmstrip

Available from: Nasco
910 Janesville Avenue
Fort Atkinson, WI 53538

OTHER:

Nursery Catalog, Wholesale Price List, Princeton Nurseries, P.O. Box 191, Princeton, NJ 08540

Consumer Information Guide, Chain Saws, U. S. Consumer Product Safety Commission, Washington, DC 20207

Pump Fundamentals Notebook, Goulds Pumps, Inc., Seneca Falls, NY

TSI Supply Catalog, TSI Company, P.O. Box 206, Flanders, NJ 07836

SELECTED LISTING OF ORGANIZATIONS AND AGENCIES PROVIDING SERVICES AND INFORMATION ON ARBORICULTURE AND RELATED SUBJECTS

New Jersey Organizations	Partial List of Publications and Services
New Jersey Shade Tree Federation P.O. Box 231 New Brunswick, NJ 08903 (201) 246-3210 William J. Porter, Executive Secretary	Trees for New Jersey Streets Laws of New Jersey Pertaining to Shade Tree Commissions The Shade Tree (periodical) Annual meeting and educational programs Arbor Day award program
Arborists Association of New Jersey 46 Overlook Avenue East Hanover, NJ 07936 John Pierson, Secretary	Membership Directory Monthly membership meeting and educational programs
New Jersey Chapter, International Society of Arboriculture P.O. Box 333 West Orange, NJ 07052 Harry P. Banker, Secretary	Membership Newsletter Annual meeting Educational programs Arbor Day award program
New Jersey Association of Nurserymen, Inc. P.O. Box 231 New Brunswick, NJ 08903 Larry D. Little, Jr., Secretary	Membership Newsletter Membership Directory Annual meeting Educational programs
The Association of New Jersey Environmental Commissions 300 Mendham Road Box 157 Mendham, NJ 07945 (201) 539-7547	Various handbooks and manuals Newletter
New Jersey Agencies	
Board of Tree Experts New Jersey Department of Environmental Protection P.O. Box CN 404, Trenton, NJ 08625 (609) 292-2520	Certified Tree Expert Law Annual Listing of New Jersey Certified Tree Experts
Division of Plant Industry New Jersey Department of Agriculture P.O. Box CN 330, Trenton, NJ 08625 (609) 292-5440	List of New Jersey Certified Nurseries Nursery Inspection

(cont'd.)

State Soil Conservation Committee New Jersey Department of Agriculture P.O. Box CN 330, Trenton, NJ 08625 (609) 292-5440	Standards for Soil Erosion and Sediment Control in New Jersey Soil survey information
Bureau of Forest Management New Jersey Department of Environmental Protection P.O. Box CN 404, Trenton, NJ 08625 (609) 292-7788	A Guide for the Protection and Care of the Urban Forest
Office of Pesticide Control New Jersey Department of Environmental Protection 380 Scotch Road, Trenton, NJ 08625 (609) 292-5890	New Jersey Pesticide Regulations Pesticide Applicator Certification
Cooperative Extension Service Cook College, Rutgers University P.O. Box 231 New Brunswick, NJ 08903	Publications, soil test mailing kits, pesticide applicator training manuals, other educational services. Contact local county extension office.

National Organizations

National Arborists Association, Inc. 1400 Wantagh Avenue Wantagh, NY 11793 (516) 221-3082 Robert Felix, Executive Secretary	Standards for pruning, guying, fertilizing, etc. Home Study Program in Arboriculture Slide/cassette programs
American Society of Consulting Arborists 315 Franklin Road North Brunswick, NJ 08902 (201) 821-8948 Dr. Spencer H. Davis, Jr., Executive Secretary	Membership directory Information brochure
Municipal Arborists - Urban Foresters Soc. Court House Square P.O. Box 1255 Freehold, NJ 07728 (201) 431-7903 David C. Shaw, Secretary-Treasurer	Membership Newsletter
The Metropolitan Tree Improvement Alliance Pennsylvania State University 103 Tyson Building University Park, PA 16802 Larry J. Kuhns, Secretary-Treasurer	Tree research and education

(cont'd.)

American Association of Nurserymen 230 Southern Building Washington, D.C. 20005	American Standard for Nursery Stock
Council of Tree and Landscape Appraisers 232 Southern Building Washington, D.C. 20005	Slide set on appraisal of damaged trees Tree Values brochure
The Committee for National Arbor Day 640 Eagle Rock Avenue West Orange, NJ 07052 Harry J. Banker, National Chairman	Arbor Day literature
American Forestry Association 1319 18th Street, N.W. Washington, DC 20036	Journal: American Forests
The National Arbor Day Foundation Arbor Lodge 100 Nebraska City, NE 68410	Tree City, USA program
American National Standards Institute, Inc. 1430 Broadway New York, NY 10018	ANSI Standard - safety requirements for tree pruning, trimming, repairing, or removal

Federal Agencies

Northeastern Forest Experiment Station U. S. Department of Agriculture 370 Reed Road Broomall, PA 19008	Urban Forestry research Visual aid materials Publications

International

International Soceity of Arboriculture, Inc. 3 Lincoln Square P.O. Box 71 Urbana, IL 61801 E. C. Bundy, Executive Secretary	Journal of Arboriculture Standard Municipal Tree Ordinance Guide Various member services Annual Meeting Educational programs

NOTE: All organizations have membership fees and most have specific membership requirements and/or categories. Some will provide information free of charge, such as a descriptive brochure and membership directory. Generally, government agencies supply printed information without charge or for a nominal fee.

PERIODICALS

Organizational

THE JOURNAL OF ARBORICULTURE International Society of Arboriculture P.O. Box 71 Urbana, IL 61801	Published monthly. Cost included with annual membership dues.
THE SHADE TREE New Jersey Shade Tree Federation P.O. Box 231 New Brunswick, NJ 08903	Published ten times per year. Cost included with annual membership dues.
THE NATIONAL URBAN AND COMMUNITY FORESTRY FORUM The American Forestry Association 1319 18th Street NW Washington, DC 20036	Bi-monthly newsletter. Free upon request.

Commercial

ARBOR AGE P.O. Box 156 Encino, CA 91426-9979	Published monthly for tree industry professionals. Yearly subscription rate.
GROUNDS MAINTENANCE 9221 Quivira Road P.O. Box 12901 Overland Park, KS 66212-0930	Published monthly for horticulture professionals. Yearly subscription rate.

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June 1984

NURSERY OPERATION AND MANAGEMENT

PURPOSE

SPECIFIC OBJECTIVES

OUTLINE

I. KINDS OF NURSERIES
II. JOB OPPORTUNITIES
III. PHYSICAL LAYOUT
IV. NURSERY EQUIPMENT
V. PROPAGATING NURSERY STOCK
VI. GROWING FIELD STOCK
VII. GROWING CONTAINER STOCK
VIII. MARKETING NURSERY STOCK

SUGGESTED ACTIVITIES

EVALUATION

REFERENCES

DIAGRAMS

HORTICULTURE CLUSTER #1

NURSERY OPERATION AND MANAGEMENT

PURPOSE:

The purpose of this unit is to provide the student with the theories and skills necessary to develop job entry skills into nursery production occupations. Students will be provided with information and skills to develop their own nursery business. Theories and skills can be related to post-high school programs in nursery production.

SPECIFIC OBJECTIVES:

After the completion of this unit, students will be able to:

1. Identify occupational opportunities in the nursery production industry.
2. Identify types of nurseries and the physical layout of a nursery.
3. Propagate nursery stock.
4. Grow nursery field stock.
5. Grow nursery container stock.
6. Market nursery products.
7. Develop a Nursery Calendar of Operations.
8. Develop a Crop Rotation Plan.
9. Identify large and small equipment used in nursery industry.

UNIT OUTLINE:

I. Identify Job Opportunities

    A. Nursery worker

    B. Nursery office personnel

    C. Nursery salesperson

- D. Nursery production management personnel
- E. Nursery technicians
    - 1. Occupational opportunities
    - 2. Educational requirements
    - 3. Competencies required
- F. Nursery business organization

II. Kinds of Nurseries

- A. Wholesale
- B. Retail or specialist nursery
- C. Garden centers
- D. Landscape nursery
- E. Mailorder nurseries
    - 1. Current business trends in the nursery business

III. The Nursery Physical Layout

- A. Selection
    - 1. Soil and water considerations
    - 2. Type of nursery enterprise
    - 3. Location
        - a. Market area in New Jersey
        - b. New Jersey climates
- B. Facilities for the nursery
    - 1. Propagating structure
    - 2. Wintering structures
    - 3. Coldframes and hotbeds
    - 4. Lath houses
    - 5. Work areas

6. Storage areas

7. Sales areas

IV. Nursery Equipment

A. Large equipment

B. Small equipment (Core Unit 4)

C. Tools and supplies (Core Unit 7)

V. Propagating Nursery Stock

A. Review of plant physiology (Core Unit 3)

B. Asexual propagation

1. Hardwood cuttings

2. Softwood cuttings

3. Greenwood cuttings

4. Grafting

a. Whip graft

b. Splice graft

c. T-budding

5. Layering

6. Division

C. Sexual propagation

1. Seed collection, cleaning and storing

2. Seed propagation

a. Greenhouse

b. Outdoor seedbed

D. Core of rooted cuttings and seedlings

VI. Growing Field Nursery Stock

A. Soil preparation

- B. Lining out stock
- C. Transplanting
- D. Irrigation
- E. Fertilization
- F. Pruning and supporting
    - 1. Top pruning
    - 2. Root pruning
    - 3. Staking
- G. Pest control
    - 1. Insects
    - 2. Diseases
    - 3. Weeds
- H. Digging nursery material
    - 1. Balled and burlapped
    - 2. Bare-root
    - 3. Machine dug
- I. Winter protection
- J. Storage of plant materials
- K. Grading nursery material
- L. Specific crops for New Jersey nurseries

VII. Growing Container Nursery Stock

- A. Container selection
- B. Growing surfaces and spacing
- C. Growing mediums
- D. Planting into containers
- E. Watering
    - 1. Semiautomatic

        2. Automatic

- F. Fertilization
- G. Pruning
- H. Pest control
- I. Winter protection
- J. Harvesting
- K. Crop schedules
- L. List of plants commonly grown as container stock in New Jersey

VIII. Marketing Nursery Stock

- A. Labeling stock
- B. Grades and standards
- C. Pricing stock
- D. Inventory of stock
- E. Advertising
- F. Packing and shipping
- G. Laws
    - 1. State
    - 2. Federal
    - 3. Local
- H. Additional product sales opportunities

SUGGESTED ACTIVITIES:

1. Plan a field trip to Princeton Nursery where all levels of nursery employment are evident. Develop a good rapport with a local nursery and make frequent visits with the class as units of instruction develop. (I-VIII)

2. Students should use prescribed text book, read and complete review exercises for career exploration and types of nurseries. (I, II)

3. It is important to have a nursery laboratory on school grounds in order to accomplish the units of instruction. A preliminary tour of the department nursery facilities and land laboratories will help students relate to the nursery units of instruction. (I, II, III)

4. Students can help establish and continue to develop nursery facilities and nursery land laboratories. A quarter acre field is an ideal size for field production exercises. A lath house constructed of 4"x4" support posts, 2"x8" overhead cross supports, a snow-fence top covering, an area covering 500 square feet will be adequate for a container growing laboratory. A pit house, 6'x12', will be adequate for propagation; a 16'x30' quonsite, poly greenhouse will be an adequate wintering house for stock. Propagating beds, 4'x8', constructed with 2"x6"s, 1/4" wire mesh supported bottoms will be ideal propagating areas. Students can relate to these structures for SOE projects. (III)

5. Through field trips to nurseries, being involved in the department nursery facilities and field laboratory and text book reading, the students make up a nursery plan, incorporating all the aspects of an efficient nursery operation. Such items include propagating bed, lath house, greenhouse and field plant populations, support facilities, equipment, sales area, etc. (III)

6. All class nursery skill activities are developed around "real" situations. Assembly line procedures stressing job efficiency are stressed. (III)

7. Have students manage the field nursery using recommended equipment: tractor and cultivator and rototiller. Have students use a power shredder, mixer and soil sterilizer in the preparation of soil mediums for container growing. (IV)

8. Have students propagate ornamentals at every opportunity. Handy 4'x8' propagating beds, pit houses and nearing frames make propagating possible at a moment's notice. Take advantage of fall pruning. Make students aware of available propagating schedules and point out the opportunities around them. (V)

9. Organize special sessions for the propagating of each specific plant material; use task sheets to evaluate their plant propagating skills. An example would be: harvesting rhododendron cuttings, bed removal and leaf reduction, proper basel cut and scaring, application of rooting hormone, proper storage of cutting before sticking, sticking and labeling of cuttings. (V)

10. Have students perform whip and splice grafting an harvested-sample twigs. Transfer this activity to real situations an any deciduous tree on school grounds, taking into consideration the improvement of the tree, i.e., a bare side of a tree where limb development would be an improvement to the tree. (V)

11. An excellent propagating activity is to root privet whips (Liqustrum obtusufaluim), containerize the rooted cutting, and the following year splice or whip graft Lilac (Syringa) onto the privet. (V)

12. In the fall, have students collect seeds from school grounds or from a selected site; research the process the seed must be exposed to and sow the seed in flats after proper stratification or scarification has been performed. (V)

13. A small conifer seed extractor can be made, constructing a wooden box with a light fixture within the box. Seed is collected and planted in the Spring; cones are used for Christmas floral work. (V)

14. In the spring, conifer seeds, such as spruce or pine can easily be planted in 4'x4' areas, protected by concrete block or 2'x6' sides with a flat cover. A rotation can be developed by which every year a new seeding is made, the students can observe two previous years seedings and perhaps three, four, five year plants, either in containers or in a field laboratory. (V)

15. All demonstrations on propagating should be encouraged for SOE programs. (V)

16. Have students maintain the nursery field laboratory: cultivation, chemical weed control, fertilization, pruning, and pest control. (IV, VI)

17. Have students line out stock from seedling beds in the field or into containers. (VI, VII)

18. Have students dig, ball and burlap mature stock. (VI)

19. Use task sheets for all nursery skills. (VI, VII)

20. If a department computer is available, develop a crop inventory; use inventory sheets to develop a nursery catalog. (VI, VII, VIII)

21. Attempt to market stock to landscapers, garden centers, school faculty, and roadside stands; develop a label with an advertising logo. (VIII)

22. Develop a department management plan for the laboratory to stress an efficient crop rotation that will produce a marketable crop every year. (VI, VII, VIII).

23. Encourage students to participate in state FFA sponsored Nursery and Landscape Contest.

24. Encourage students to seek employment in the nursery business; encourage the initiation of a small nursery. (I-VIII)

25. Have students collect pests and diseases of ornamental plants. Have each identified with control measures.

26. Have students identify weeds to be controlled in a nursery and help them select herbicides taking crop tolerance into consideration.

27. Arrange for students to observe various nursery equipment in operation such as: hydraulic tree and shrub diggers; transplanting machines, root pruners.

REFERENCES:

Nursery Production, Student Handbook, and Teachers Manual, Teacher Education Series, Volume 12, Number 4s, 4t, 1971; The Pennsylvania State University, College of Agriculture, Department of Agricultural Education, University Park, Pennsylvania.

A Manual on Nursery Practices, California State Polytechnic College, San Luis Obispo.

Plant Propagation, Hartmann, H. T. and D. E. Kester, Prentice-Hall, Inc., Englewood Cliffs, NJ.

Plant Production in Containers, Carl E. Whitcomb, Lacebark Publications, Route 5, Box 174, Stillwater, OK 74074.

American National Standard for Tree Care Operations American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

American Standard for Nursery Stock, American Association of Nurserymen, 230 Southern Building, Washington, DC 2005.

Pesticides for New Jersey, New Jersey Cooperative Extension Service, Rutgers--The State University of New Jersey, 1984.

Equipment Manuals (operating and maintenance guide) for various types and brands of nursery production equipment.

Agriculture Extension Service, weekly bulletins dealing with current pest problems and their controls.

PERIODICALS:

American Nurseryman, American Nurseryman Publishing Co., 310 S. Michigan Avenue, Suite 302, Chicago, IL 60604.

BULLETINS:

Insect and Disease Leaflet Set
Growing Christmas Trees in New Jersey

Available from: County Agriculture Extension Service

AUDIO VISUAL:

Propagating Ornamental Plants
C10429P filmstrip and cassette

Fertilizing Ornamental Plants
C10432P filmstrip and cassette

Growing Media for Ornamental Plants
C10430P filmstrip and cassette

Elements of Pruning
C10450P filmstrip and cassette

Pruning Evergreens
C10273P filmstrip

Pruning, Deciduous Shrubs
C10274P filmstrip

Pruning Flowering Trees
C10275P filmstrip

Propagation By Air Layering
C10174P filmstrip

Budding and Grafting
C10433P filmstrip and cassette

Propagation of Deciduous Shrubs for Nursery Production
C10513P filmstrip

Propagation of Evergreens for Nursery Production
C10512P filmstrip

Container Production of Nursery Stock
C10511P filmstrip

Hand Digging of Trees and Shrubs
C10509P filmstrip

Controlling Pests of Ornamental Plants
C10431P filmstrip and cassette

Understanding and Safe Use of Pesticides
C10515P filmstrip

Selecting and Handling Pesticides
C10516P filmstrip

Calibrating and Applying Pesticides Safely
C10517P filmstrip

Nasco
901 Janesville Avenue
Fort Atkinson, Wisconsin 53538

OTHER:

Horticulture Task Sheets, Nursery Production (21 task sheets)

Department of Agricultural
and Extension Education
The Pennsylvania State University
University Park, PA 16802

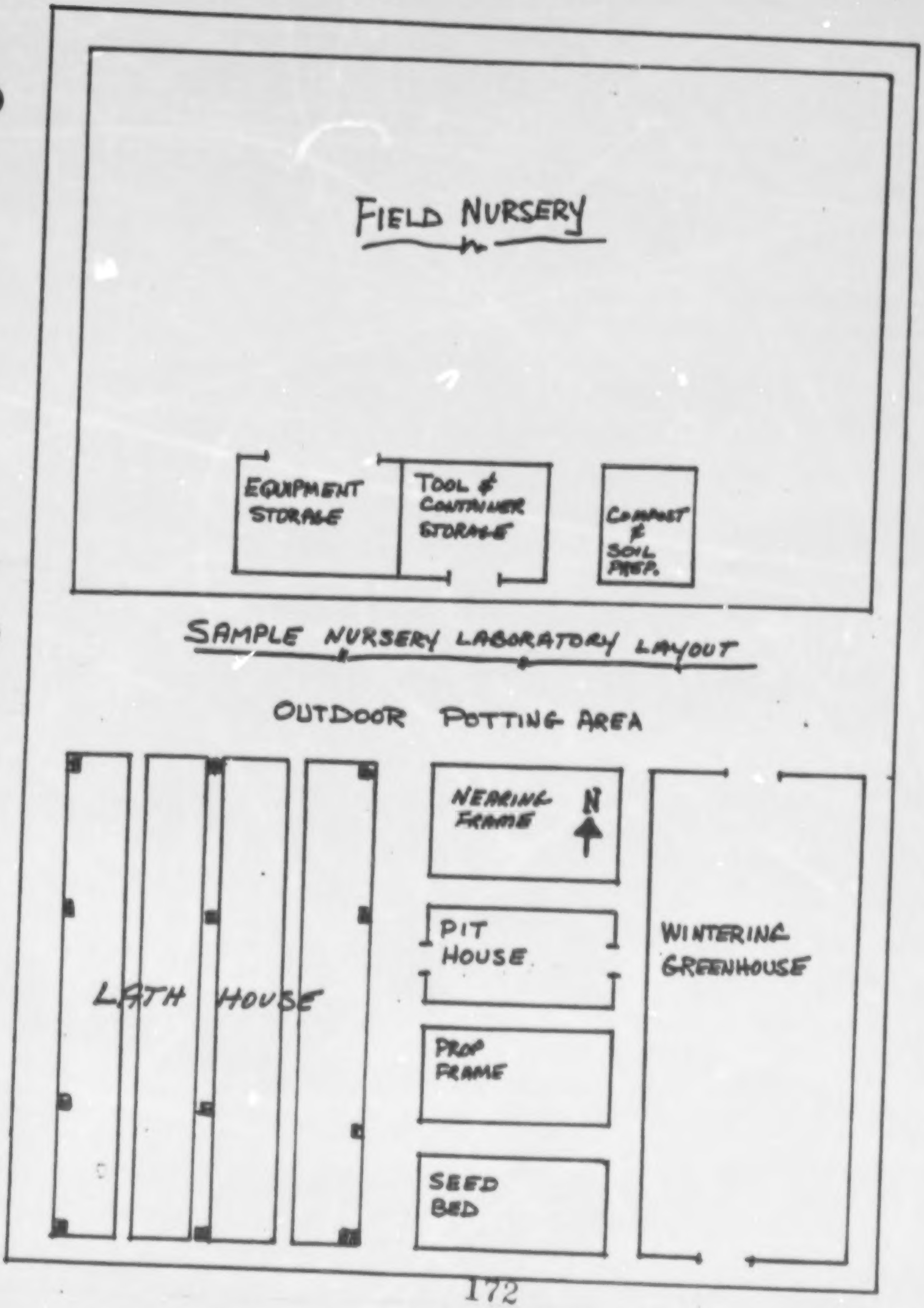
Nursery Worksheets (12)

Hobar Publications
1234 Tiller Lane
St. Paul, MN

EVALUATION

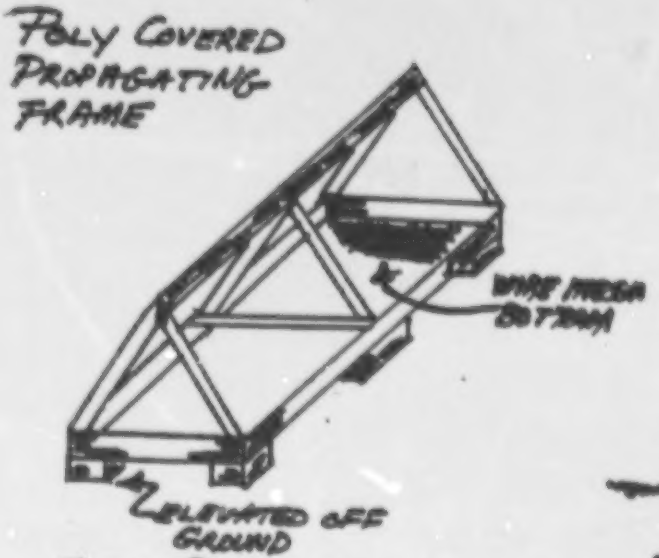
		Suggested Method	
	Area of Evaluation	Written	Performance
1.	Identify job opportunities in nursery industry. (I)	X	
2.	Define kinds of nurseries:	X	
	A. Whole sale (II)		
	B. Retail (II)		
	C. Garden Center (II)		
	D. Landscape Nursery (II)		
	E. Mailorder Nursery (II)		
3.	Stretch the physical layout of a typical nursery.	X	X
4.	Identify different areas in nursery layout.	X	
5.	List advantages and disadvantages of growing container stock. (VII)		
6.	Grow container nursery stock. (VII)		X
7.	Propagate nursery stock:		
	A. Hardwood (V)		
	B. Softwood (V)		
	C. Greenwood (V)		
	D. Division (V)		
8.	Graft nursery stock:		X
	A. Whip (V)		
	B. Splice (V)		
	C. T-bud (V)		
9.	Grow field stock. (VI)		X
10.	Properly market nursery stock. (VIII)		X
11.	ANA grades and standards. (VIII)	X	
12.	Identify major insect and diseases of nursery stock. (VI)	X	X

13. Ball and burlap a tree or shrub. (VI)		X
14. Plant bare-root stock. (VI)		X
15. Develop a calendar of activities for a New Jersey nursery. (VII)	X	X
16. Develop a crop rotation plan. (VII)	X	
17. Identify large and small equipment used in nursery industry. (IV)	X	
18. Demonstrate proper use of nursery tools. (IV)		X

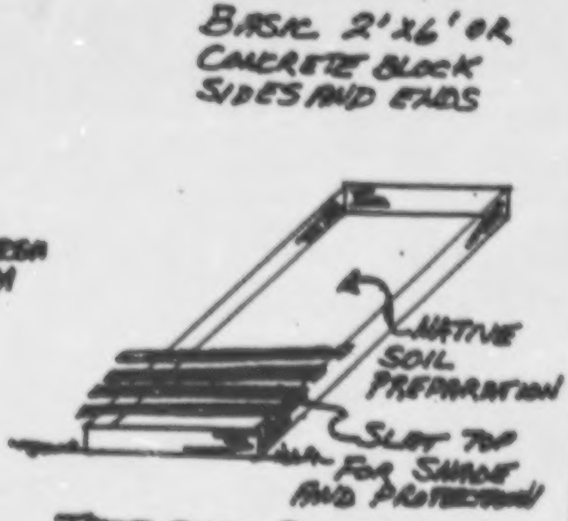

FIELD NURSERY
EQUIPMENT STORAGE
TOOL & CONTAINER STORAGE
COMPOST & SOIL PREP.
OUTDOOR POTTING AREA
NEARING FRAME
N
PIT HOUSE
PROP FRAME
SEED BED
LATH HOUSE
WINTERING GREENHOUSE

SAMPLE NURSERY LABORATORY LAYOUT

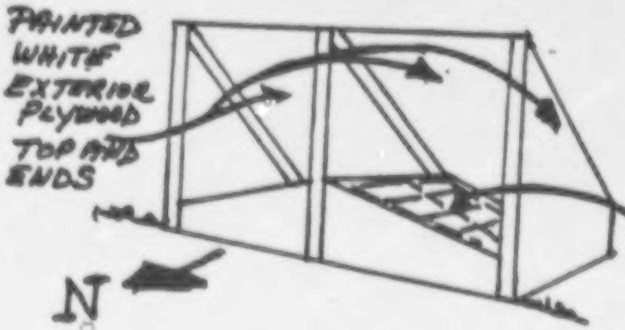
PROPAGATING STRUCTURES FOR THE NURSERY LAB


POLY COVERED
PROPAGATING
FRAME
WIRE MESH
BOTTOM
ELEVATED OFF
GROUND

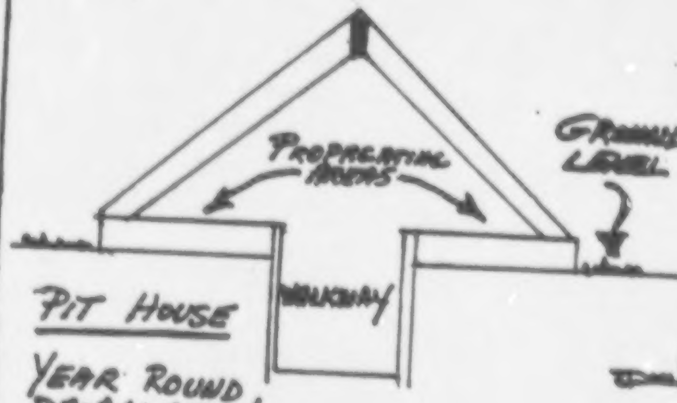
STEM PROPAGATION


BASIC 2'X6' OR
CONCRETE BLOCK
SIDES AND ENDS
NATIVE
SOIL
PREPARATION
SLAT TOP
FOR SHADE
AND PROTECTION

TREE SEED PROPAGATION

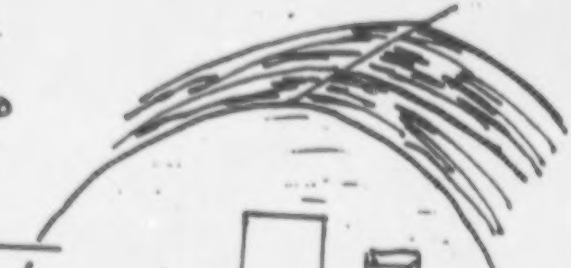

PAINTED
WHITE
EXTERIOR
PLYWOOD
TOP AND
ENDS
POLY OR SASH COVER
N

NEARING FRAME
WINTER RHODODENDRON
PROPAGATION


PROPAGATING
AREAS
GROUND
LEVEL
WALKWAY

PIT HOUSE

YEAR ROUND
PROPAGATION



POLY QUONSET
WHITE POLY COVER WINTER HOUSE

LANDSCAPE DESIGN, ESTABLISHMENT, AND MAINTENANCE

LANDSCAPE DESIGN

PURPOSE

SPECIFIC OBJECTIVES

OUTLINE

I. IDENTIFY JOB OPPORTUNITIES

II. IMPORTANCE OF LANDSCAPING

III. ANALYSIS OF LANDSCAPE REQUIREMENTS

IV. DEVELOPING A LANDSCAPE PLAN

V. STRUCTURES AND PLANTS

VI. DRAWING THE LANDSCAPE PLAN

VII. ESTIMATING LANDSCAPE COSTS

SUGGESTED ACTIVITIES

EVALUATION

REFERENCES

LANDSCAPE DESIGN, ESTABLISHMENT, AND MAINTENANCE

LANDSCAPE DESIGN

PURPOSE:

The purpose of this unit is to provide the student with the theories and skills necessary to develop a basic, scaled landscape design. Students should relate theories and skills to personal home surroundings, to the community in which they live, and to past high school training in landscape design/architecture.

SPECIFIC OBJECTIVES:

After the completion of this unit, students will be able to:

1. Identify occupational opportunities in landscape design.
2. Understand the reasons for landscaping.
3. Determine the landscape requirements of a site.
4. Understand and develop the three areas of a landscape design.
5. Develop a working knowledge of plants including annual and perennial flowers (or "both woody and herbaceous") and structural materials used in a landscape plan.
6. Develop an ability to draw to scale a landscape plan.
7. Develop the ability to estimate the cost of a landscape plan.

UNIT OUTLINE:

I. Identify Job Opportunities.

  A. Landscape Architect

  B. Landscape Designer

  C. Horticultural Extension Agent

  D. Landscape Nurseryman

        1. Occupational opportunities
        2. Educational requirements
        3. Competencies required

II. Importance of Landscaping

- A. Aesthetic values of a landscape
- B. Utility needs of a landscape
- C. Benefits derived from landscaping
    - 1. Increased property value
    - 2. Environmental considerations

III. Analysis of Landscape Requirements

- A. Determine landscape needs of family
- B. Determine needs of a site
- C. Integrate site analysis and family needs
- D. Relating on-site factors with off-site factors

IV. Developing A Landscape Plan

- A. Layout the three parts of a landscape
    - 1. Public Area
    - 2. Private Area/Recreational Area
    - 3. Service Area
- B. Employ basic landscape design theories
    - 1. Funnel system
    - 2. Inverted T
    - 3. Focal point
    - 4. Framing
    - 5. Balance and proportion
    - 6. Rhythm
    - 7. Scale relationships

8. Types of planting systems

a. Foundation

(1) Corner

(2) Entrance

b. Border

c. Screen

d. Shade

e. Specimen

f. Background

g. Underplantings

V. Structures and Plants

A. Landscape structures and associated symbols

1. Transport Structures

a. Walks

b. Driveways

c. Steps

d. Patios

2. Retention and Screening Structures

a. Walls

b. Fences

3. Recreational Structures

a. Pools and fountains

b. Swimming pools and hot tubs

c. Decks

d. Play areas

B. Landscape Plant Materials and Associated Symbols

1. Kinds of Plants

- a. Trees, shrubs, and ground covers
    - (1) Evergreen or deciduous
    - (2) Size, shape and growing characteristics
  - (3) Special plant features
  - (4) Use in the landscape plan
  - (5) Cultural adaptation to the landscape plan
- b. Herbaceous plant material
  - (1) Annuals, perennials
  - (2) Bulbs
  - (3) Use in planters

VI. Drawing the Landscape Plan

- A. Tools used in drafting the plan
- B. Symbols used in the plan
- C. Layout of the plan
- D. Executing a landscape plan to scale

VII. Estimating Landscape Costs

- A. Cost of plant materials
- B. Cost of installing plant materials
- C. Cost of construction materials
- D. Cost of installing construction materials
- E. Cost of turf grass installation
- F. Fee for landscape design

SUGGESTED ACTIVITIES:

1. Review advertisements in daily papers and trade magazines relative to landscaping occupations. (I)
2. Refer to specific horticulture career information through a computer Service System: GIS, Guidance Information System and CIDS, Career Information Delivery System. (I)

3. Have students review trade magazines and report on horticultural occupations. (I)

4. Have local landscapers and community developers speak to students or organize a field trip(s) to local landscape businesses or community developers. (I)

5. Read assigned text and complete written exercises. (I-VII)

6. Project slides of landscape examples to illustrate basic landscape ideals. (II)

7. Develop and use a site and family analysis check-off list. (III)

8. Visit an appropriate site for landscaping with the class and do a site analysis. (III)

9. Use various site analysis tools: transit, soil sampling and testing equipment, soil auger, measuring tape or gandy wheel, camera, directional compass. (III)

10. Building Our American Community (BOAC) projects, where applicable, can be used as training stations for site analysis. (III)

11. Students involved in landscaping projects can use landscape analysis data for important SOE project book planning entries. (III)

12. Visit well landscaped homes to illustrate landscape layout, employment of design theories and use planting systems. (IV)

13. Through the use of overlays and an overhead projector, have students present their solutions to a given landscape problem, indicating landscape areas and planting systems which bring about sound fundamental landscape principles. (IV)

14. Encourage the development of landscape structures through SOE home improvement projects, BOAC projects, specifically school related projects; strive to develop landscape structures on school grounds for instructional purposes. (V)

15. Use commercial or self-prepared overlays showing landscape structures.

16. Identify plant materials and categorize them according to landscape use. Use the school grounds, local landscaped home, parks, arboretums and nurseries for plant material identification. (V)

17. Issue to students drafting board and instruments and introduce a basic unit on the use of drafting instruments. The unit should include plotting a residence and property on drafting paper; using proper landscape symbolization. Begin to employ in the drawing information attained in Suggested Activities numbers 8 and 9. (VI)

18. Have students execute a landscape design. The design assignment can be an individual project or a class project divided into individual sections for development. (VI)

19. Complete a landscape cost analysis on suggested activity number 18. Have students sell and support their plan in a "role-play" situation.

20. Obtain landscape plans produced by professionals and develop a practicum on plan interpretation, analysis, and use of symbols. (VI)

21. Encourage students to participate in State FFA sponsored Nursery and Landscape contest. (I-VI)

EVALUATION

	Suggested Method	
Area of Evaluation	Written	Performance
1. Identify job opportunities. (I)	X	
2. Importance of Landscaping. (II)	X	
3. Analysis of Landscape Requirements. (III)	X	X
4. Developing a Landscape Plan. (IV)	X	X
5. Draw landscape structure and plant symbols.	X	
6. Identify trees, shrubs, ground covers, annuals and perennials.		X
7. Identify types of structures used in landscaping and their materials.	X	
8. Draw the complete landscape plan to scale.	X	X
9. Estimating landscape costs.	X	X

SUGGESTED TEXTS:

Ingels, Jack E., Landscaping, Second Edition, Delmar Publishers, Inc., Albany, New York 12205, 1983.

Landscape Design, Student Handbook, Teacher Education Series, Volume 9, Number 30, 1968, The Pennsylvania State University, College of Agriculture, Department of Agriculture Education, University Park, Pennsylvania.

Landscaping Your Home, William C. Nelson, Jr. Circular IIII, Cooperative Extension Service, College of Agriculture, University of Illinois at Urbana-Champaign, 1975.

REFERENCES:

Manual of Woody Landscape Plants, Michael A. Dirr, 3rd edition, Stipes Publishing Company, 10-12 Chester Street, Champaign, IL 61820.

Common Forest Trees of New Jersey, Austin N. Lentz, Cooperative Extension Service, Cook College, New Brunswick, NJ 08903.

Know It and Grow It, Carl E. Whitcomb, Ph.D., 1983, Lacebrook Publications, RT 3, Box 251F, Stillwater, OK 74076.

A Field Guide to Trees and Shrubs, George A. Petrides, Houghton Mifflin Company, NY.

Building Barbecues
Decks for Outdoor Living
Garden Pools, Fountains, and Waterfalls
Garden Work Centers
Sunset Patio Book
Swimming Pools
Walks, Walls and Patio Floors
Entryways and Front Gardens
Sunset Landscaping Book
Lawns and Ground Covers
    Lane Magazine and Book Company
    Menlo Park
    California 94025

Landscape Gardening
Trees
Flowering Shrubs
Perennials
Annuals
Roses

Lawns and Ground Covers
Time-Life Books
Rockefeller Center
New York, New York 10020

Landscape Architecture. John Ormsbee Simonds, McGraw-Hill Book Co., Inc., 1221 Avenue of the Americas, New York, NY 10020, 1961.

A Guide to Site and Environmental Planning. Second Edition, Harvey M. Rubenstein, Wiley-Interscience, John Wiley & Sons, 605 Third Avenue, New York, NY 10016; 1980.

PERIODICALS:

American Nurseryman. American Nurseryman Publishing Co., 310 S. Michigan Avenue, Suite 302, Chicago, IL 60604.

Grounds Maintenance. Intertec Publishing Corp., 9221, Quivira Road, Overland Park, KS 66215.

Weeds, Trees and Turf. Harcourt, Brace Jovanovich Publications, 7500 Old Oak Boulevard, Cleveland, OH 44130.

Horticulture. Horticulture Associates, 755 Boylston Street, Boston, MA 02116.

AUDIO VISUALS:

Transparencies

Landscape Planting and Bed Preparation
C11147P; set of 30 transparencies

Landscape Construction Accessories
C11148P; set of 74 transparencies

Landscape Construction
C11149P; set of 86 transparencies

Nasco
901 Janesville Avenue
Fort Atkinson, WI 53538

Patterns for Garden Walks (BSM-72)
Patio Paving Designs (BSM-73)
Retaining Walls (BSM-71)
Outside Fireplaces and Grills (BSM-74)

DCA Educational Products, Inc.
424 Valley Road
Warrington, PA 18976

Films

Importance of Landscape Design
Selecting and Arranging Trees and Shrubs

Colonial Films
3350 Alvin Road
Alpharetta, GA 30201

Filmstrip and Tape

An Exercise In Differential Leveling.
Vocational Education Productions,
California Polytechnic State University,
San Luis Obispo, CA 93407

Filmstrip and Guide

Creating A Design C12233P

Introduction to Landscape Design C12229P

Nasco
901 Janesville Avenue
Fort Atkinson, WI 53538

Slide Set

Landscape Design: Small Properties, Naturalistic Landscapes and Patios (67 slides)

Vocational Agriculture Service
1401 S. Maryland Drive
University of Illinois
Urbana, IL 61801

OTHER

Visualizer 3-D Landscape Kit C8305P

Nasco
901 Janesville Avenue
Fort Atkinson, WI 53538

Bulletins

Landscape Planning
How to Landscape Your Home
Do's and Don'ts in Landscape Design
Native New Jersey Vines and Shrubs
Ten Tap Trees of Tomorrow
Fifty Small Trees for New Jersey Home Grounds

Seashore Plants
Trees for Shade and Beauty
Selecting Shrubs for Shaddy Areas

Available from: County Agriculture Extension Services

TIME ALLOTMENT: 16 weeks
5 days per week
2, 42 min. pds. per day
112 hours

LANDSCAPE GARDENING AGREEMENT

To avoid misunderstandings of landscape maintenance and/or landscape establishment services provided by _______________, the privilege is taken to record the services and circumstances affecting such services.

To initiate landscape maintenance and/or establish activities as early as professionally advisable in the spring, maintain a schedule of attention, and to terminate services after fall maintenance activities. (A winter maintenance program is available.)

To render recommended and agreed upon landscape maintenance and/or establishment activities. (See attached landscape gardener-customer worksheet.)

To render a charge for such services as determined by a job estimate. The charge may vary as to supplies or specialized equipment used.

To be assured that liability insurance is being carried by the landscape gardeners and therefore is responsible for property damage due directly to the services being performed.

To agree that payment for such services be rendered upon completion of the job, monthly, or upon agreement.

The landscape gardening agreement is considered void if the landscape gardener does not perform or does unsatisfactory work; the agreement is void if the customer is delinquent in payment of services.

To promote a basis of understanding and to promote a sound business relationship, this memorandum is established on _______________, 19__.

________________________________ Home Owner

________________________________ Landscape Gardener

ACE LANDSCAPE GARDENER COMPANY

Job Worksheet

Maintenance Schedule

Lawn area mowed ______________
Shrub and flower beds maintained _______________
Walks, patio areas, etc., trimmed_______________
Areas cleaned, i.e., walks swept_______________

Pruning of landscape materials _________________
Fertilizing _______________
Liming _______________
Soil Testing _______________
Application of pesticides ______________

Specify:

Other:

Estimate: _____

Establishment

Planting trees, shrubs, flowers
Establishing lawns
Constructing landscape supplements

Specify:

Other:

Estimate: _____

LANDSCAPE DESIGN, ESTABLISHMENT, AND MAINTENANCE

LANDSCAPE ESTABLISHMENT

PURPOSE

SPECIFIC OBJECTIVES

OUTLINE

I. IDENTIFY JOB OPPORTUNITIES

II. UNDERSTANDING AND LAYING OUT A LANDSCAPE PLAN

III. DETERMINING THE PROPER GRADE AND DRAINAGE FOR THE LANDSCAPE SITE

IV. MODIFICATION OF SOILS ON THE SITE

V. PLANTING TREES AND SHRUBS

VI. ESTABLISHMENT OF TURF

VII. PLANTING GROUND COVERS AND HERBACEOUS PLANTS

VIII. CONSTRUCTION OF LANDSCAPE STRUCTURES

IX. OBTAINING MATERIALS FOR THE LANDSCAPE JOB

SUGGESTED ACTIVITIES

REFERENCES

HORTICULTURE CLUSTER #1

LANDSCAPE DESIGN, ESTABLISHMENT, AND MAINTENANCE

LANDSCAPE ESTABLISHMENT

PURPOSE:

The purpose of this unit is to provide the student with the theory and skills necessary to establish or install a prepared landscape design according to proper specifications. Students should relate theories and skills to personal home surroundings, to community and school projects. Students should achieve job entry skills for landscaping positions, skills for personal landscaping business needs and experiences to enhance past high school education in landscape courses.

SPECIFIC OBJECTIVES:

After the completion of this unit, students will be able to:

1. Identify occupational opportunities in landscape establishment.
2. Understand and layout a landscape plan.
3. Grade and drain a landscape site.
4. Test and modify soils.
5. Plant different types of trees and shrubs into a landscape.
6. Establish lawn areas in a landscape.
7. Plant ground covers, perennials, and annuals.
8. Construct walls, patios, walks, and related landscape structures.
9. Purchase materials for the landscape job.

UNIT OUTLINE:

- I. Identify Job Opportunities
  - A. Landscape nurseryman
  - B. Landscaper
  - C. Landscaper worker
    - 1. Occupational opportunities
    - 2. Educational requirements
    - 3. Competencies required
- II. Understanding and Laying Out A Landscape Plan
  - A. Blueprint interpretation
    - 1. Direction orientation
    - 2. Scale
    - 3. Symbols
      - a. Construction
        - (1) House features
        - (2) Walks, drives, walls, fences, patios
        - (3) Pools, grills
      - b. Utilities
      - c. Plant materials and areas
    - 4. Contour lines
  - B. Laying out plan
    - 1. Staking out plant materials
    - 2. Determining plant beds
    - 3. Staking out construction features of landscape

III. Determining the Proper Grade and Drainage for the Landscape Site

 A. Grading the site

  1. Determine proper grade for a specific landscape area

   a. Percent of grade

   b. Cut grade versus fill grade

   c. Stockpiling of topsoil

  2. Care of existing plant materials

   a. Protection during grading

   b. Constructing dry wells

 B. Drainage of the landscape site

  1. Determine need for drainage

  2. Surface drainage

   a. Specifications

   b. Grading

  3. Internal drainage

   a. Tile drain systems

   b. Vertical drains

IV. Modification of Soils On the Site

 A. Determine fertility level

 B. Determine the pH

 C. Determine the soil texture

 D. Apply information on fertility, pH and texture to site needs

  1. Fertilizer and lime rates and application

  2. Kind, rate and application of soil amendments

V. Planting Trees and Shrubs

A. Transplanting trees

1. Balled and burlapped

2. Bareroot

a. Preparation of hole

b. Wrapping and staking

c. Watering

d. Care after planting

B. Transplanting shrubs

1. Balled and burlapped

2. Containers

a. Preparation of hole

b. Watering

c. Care after planting

VI. Establishment of Turf (Core: Horticulture Practices)

A. Seeding lawns

1. Soil amendments and preparation

2. Fertilizer and lime

3. Seeding

a. Kind

b. Rate

c. Application

d. Mulching

e. Irrigation

- f. Initial care

- B. Sodding lawns
    - 1. Soil amendments and preparation
    - 2. Installation of sod
    - 3. Watering and initial care

VII. Planting Ground Covers and Herbaceous Plants

- A. Planting ground covers
    - 1. Kinds of ground covers
    - 2. Bed preparation
    - 3. Spacing
    - 4. Planting
    - 5. Mulching and watering
- B. Planting herbaceous plants
    - 1. Annuals
    - 2. Perennials
    - 3. Bulbs
        - a. Spring bulbs
        - b. Fall bulbs
            - (1) Fertilizer and lime requirements
            - (2) Bed preparation
            - (3) Spacing and planting
            - (4) Mulching and weed control

VIII. Construction of Landscape Structures

- A. Walls
    - 1. Dry walls

        - a. Floating installation
        - b. Slant and height
        - c. Placement of stone
    - 2. Free standing walls
        - a. Poured concrete
        - b. Brick and stone
            - (1) Footing installation
            - (2) Placement of brick or stone with mortar

- B. Patios and walks
    - 1. Poured concrete
    - 2. Brick, patio block, slate, flagstone set in mortar
    - 3. Brick set with sand
    - 4. Wood and stone set in mortar
        - a. Layout of area
        - b. Installing base
        - c. Drainage
        - d. Installing forms
        - e. Installing patio material
            - (1) Using mortar or concrete
            - (2) Developing grade for surface drainage
            - (3) Finish for appearance
- C. Related structures and materials
    - 1. Railroad ties
        - a. Borders

        - b. Retaining walls
        - c. Steps
    - 2. Stairs or steps
        - a. Layout
            - (1) Riser
            - (2) Tread
            - (3) Horizontal space requirement
        - b. Installation
            - (1) Brick and stone
            - (2) Railroad ties
    - 3. Fencing
        - a. Layout
        - b. Installation of posts
        - c. Fence installation
        - d. Gate installation
    - 4. Barbecues, decks

IX. Obtaining Materials for the Landscape Job

- A. Plant materials
    - 1. Wholesale nurserymen
    - 2. Retail nurserymen
    - 3. Garden centers
        - a. American standards for nursery stock
        - b. Discounts
        - c. Guarantees
- B. Non-plant materials

1. Building materials supply houses
2. Hardware stores
3. Garden centers
4. Lumber companies
5. Garden centers
6. Saw mills and fence companies
    a. Price comparisons
    b. Service
    c. Availability
    d. Convenience

SUGGESTED ACTIVITIES:

1. Review advertisements in local papers for job opportunities; refer to specific horticulture career information through a computer service system: GIS, Guidance Information System and CIDS, Career Information Delivery System. (I)

2. Review professionally prepared landscape plans; test the students on an understanding of the landscape plan specifications. (II)

3. Select a design created by a student(s) and actually layout the landscape(s) according to plan specifications. (II)

4. BOAC or other community projects relating to landscaping should be laid out by the class. (II)

5. Students developing SOE landscape improvements for their homes should lay out the projects as a class project. (II)

6. Students apply skills in using a farm level or transit in developing proper grades for a landscape. (III)

7. Using the school grounds as a laboratory, detect eroding areas; correct the erosion problem employing proper grading principles and practices. (III)

8. Call upon the local Soil Conservation Service to demonstrate, recommend and assist in correcting school grounds erosion and drainage problems. (III)

9. Demonstrate a simple vertical drain by installing one beneath a rain gutter downspout. (III)

10. Determine internal drainage of a site by examining soil borings for mottling; run a percolation test. (III)

11. Prepare a planting or lawn area by applying soil amendments, fertilizer, and lime with the use of a rotatiller. Use a site related to a student project, school or community. (IV)

12. Demonstrate transplanting of trees and shrubs via planned activities, such as additions to a school arboretum and Arbor Day plantings. Students obtain transplanting skills on class developed landscape plans. Develop an organized work crew, delegating chores and responsibility for maximum job efficiency. (V)

13. Select poorly sodded areas on school grounds and reseed areas. Limit the work area to the equipment and time available. (VI)

14. Encourage the seeding or sodding of areas that students have developed plans for SOE programs. (VI)

15. Encourage students to seek or take advantage of employment opportunities offered by the agriculture department in local landscape establishment or maintenance and nursery businesses. (V, VI, VII, VIII)

16. Encourage students to start their landscape business, individually or as partners. (V, VI, VII, VIII)

17. Develop small landscaped areas around the agriculture department showing the use of plant materials while improving the beauty of the agriculture department. Incorporate samples of landscape structures, such as patio designs, benches, and fencing. (VII, VIII)

18. Cooperate with other agricultural classes, specifically agricultural mechanics, in coordinating landscape structure projects. (VIII)

19. Develop an annual flower bed yearly and develop and maintain a perennial flower bed as an outside laboratory. Plant bulbs on school grounds to accent areas. Establish ground covers in appropriate areas. Label materials and encourage the community to visit these laboratories. (VIII)

20. Volunteer the class for small landscape establishment projects for grammar schools and garden club community projects; offer students SOE credit in the area of supplementary practice. (V, VI, VII)

21. Offer SOE credits in the area of supplementary practice for BOAC projects relating to landscaping. (V, VI, VII, VIII)

22. Visit local garden centers and develop a list of available patio and fencing materials, mulches, railroad ties and record the prices. Develop a comparison list of the materials. (IX)

23. Have students obtain material prices from various nursery catalogs. (IX)

24. Read assigned text and complete written exercises. (I-IX)

25. Encourage students to participate in State FFA sponsored Nursery and Landscape Contest. (I-IX)

26. Encourage those students with active participation in landscape establishment, through SOE home improvement, supplementary practices or placement, to apply for National FFA Proficiency Awards in appropriate areas. (I-IX)

SUGGESTED TEXTS:

Landscaping, Second Edition, Ingels, Jack E., Delmar Publishers, Inc., Albany, New York 12205, 1983.

Landscape Maintenance and Establishment, Student Handbook, Teacher Education Series, Volume 9, Number 2s, 1968. The Pennsylvania State University, College of Agriculture, Department of Agriculture Education, University Park, Pennsylvania.

REFERENCES:

Building Barbecues
Decks for Outdoor Living
Garden Pools, Fountains, and Waterfalls
Sunset Patio Book
Swimming Pools
Walks, Walls, and Patio Floors
Lane Magazine and Book Company
Menlo Park
California 94025

American Standards for Nursery Stack,
American Association of Nurserymen, Inc.,
835 Southern Building, Washington, D.C. 20005 1980

Handbook on Garden Construction,
Brooklyn Botanic Garden, Brooklyn, New York

Handbook of Concrete Farm Construction,
Portland Cement Association, 33 West Grand Avenue,
Chicago 10, Illinois

PERIODICALS

American Nurseryman, American Nurseryman Publishing Co., 310 South Michigan Avenue, Suite 302, Chicago, Illinois 60604

Grounds Maintenance, Intertec Publishing Corp., 9221 Quivira Rd., Overland Park, Kansas 66215

AUDIO VISUALS

Transparencies

Landscape Planting and Bed Preparation
C11147P: set of 30 transparencies

Landscape Construction Accessories
C11148P; set of 74 transparencies

Landscape Construction
C11149P; set of 86 transparencies

Nasco
901 Janesville Avenue
Fort Atkinson, WI 53538

SLIDES

Plan Interpretation, Surveying, Edging, Planning, and Bed Preparation C10404P 72 slides

Planting, Protecting Existing Features, Drainage and Driveways C10405P 71 slides

Walks, Steps, and Retaining Walls
C10406P 80 slides

Fencing and Patios C10407P 73 slides

Mounds and Boulders, Statuary and Lighting
C10408P 74 slides

Structures, Seating, Play Areas, and Containers
C10409P 81 slides

Water Features, Irrigation and Materials
C10410P 81 slides

Nasco
901 Janesville Avenue
Fort Atkinson, WI 53538

OTHER

Nursery Catalog, Wholesale Price List, Princeton Nurseries, P.O. Box 191, Princeton, NJ 08540

TIME ALLOTMENT: 16 weeks
5 days per week
2, 42 min. pds. per day
112 hours

LANDSCAPE DESIGN, ESTABLISHMENT AND MAINTENANCE

LANDSCAPE MAINTENANCE

PURPOSE

SPECIFIC OBJECTIVES

OUTLINE

- I. IDENTIFY JOB OPPORTUNITIES
- II. UNDERSTANDING THE ELEMENTS OF A WELL MAINTAINED LANDSCAPE
- III. MAINTAINING THE LANDSCAPE LAWN AREAS
- IV. PRUNING PLANT MATERIALS ON THE LANDSCAPE
- V. MAINTAINING PLANT MATERIALS
- VI. DEVELOPING BUSINESS PROCEDURE

SUGGESTED ACTIVITIES

EVALUATION

REFERENCES

HORTICULTURE CLUSTER #1

LANDSCAPE DESIGN, ESTABLISHMENT AND MAINTENANCE

LANDSCAPE MAINTENANCE

PURPOSE:

The purpose of this unit is to provide the student with the knowledge and skills necessary to maintain an established landscape. Students should relate theories and skills to personal home surroundings, to the community in which they live, and school environment. Students should achieve job entry skills for landscape maintenance positions, skills for personal landscape maintenance business needs and experiences to enhance post high school education in landscape courses.

SPECIFIC OBJECTIVES:

After the completion of this unit, students will be able to:

1. Identify occupational opportunities in landscape maintenance.
2. Understand and appreciate a quality, maintained landscape.
3. Properly maintain lawn areas.
4. Properly prune trees and shrubs.
5. Properly maintain planting beds
6. Properly fertilize plant materials.
7. Properly practice safe insect and disease control.
8. Operate landscape maintenance tools and equipment properly and safely.
9. Initiate sound business practices.

UNIT OUTLINE:

I. Identify job opportunities

- A. Grounds superintendent
- B. Park foreman
- C. Landscape maintenance worker
    - 1. Occupational opportunities
    - 2. Educational requirements
    - 3. Competencies required

II. Understanding the Elements of a Well Maintained Landscape

- A. Physical appearance
    - 1. Lawns
    - 2. Beds
    - 3. Plant materials
    - 4. Edging
    - 5. Raking, sweeping, refuse removal
- B. Cultural aspects
    - 1. Nutritional needs
    - 2. Freedom of pests
    - 3. Pruning requirements

III. Maintaining the Landscape Lawn Areas

- A. Lawn areas
    - 1. Spring fertilizer and lime application
    - 2. Fall fertilizer and lime application
        - a. Soil sampling and testing
        - b. Using a cyclone and drop spreader
            - (1) Using organic and inorganic fertilizer
            - (2) Calibrating a spreader

        (3) Applying fertilizer

        (4) Maintaining the cyclone and drop spreaders

3. Mowing

    a. Height of cut versus grass species

    b. Operating a power rotary mower safely

        (1) Push and self power walk behind mowers

        (2) Riding mowers

    c. Maintaining the rotary mower (Core: Power)

        (1) Blade sharpening

        (2) Oil and oil filter change

        (3) Spark plug, points, and condenser

        (4) Air cleaner

        (5) Carburetor

4. Thatching and aerating equipment

    a. Operating a thatcher and aerator safely

    b. Maintaining blades and pluggers

    c. Maintaining the engine components as listed in III, 3C

5. Miscellaneous power equipment

    a. Edger

    b. Nylon-line weeder

    c. Power vacuum

    d. Blower

    e. Sweeper

        (1) Operating safely

        - (2) Maintaining according to operator's manual and as listed in III, 3C

  6. Pest control in lawns
     - a. Insect
     - b. Disease
     - c. Weeds
       - (1) Diagnosis
       - (2) Time of treatment
       - (3) Material and application rate
       - (4) Pesticide precautions
       - (5) Pesticide application equipment
         - (a) Cyclone and drop spreader
         - (b) Hose - on sprayer
         - (c) Power sprayers

  7. Lawn irrigation
     - a. Time of irrigation
     - b. Rate of water

  8. Miscellaneous activities
     - a. Clean up
     - b. Rolling
     - c. Spot reseeding

IV. Pruning Plant Materials on the Landscape (Core: Horticulture Practices, Basic Knowledge)

  A. Understand anatomy of plant
     1. Terminal brand
     2. Scaffold branch

    3. Crotch
    4. Canopy
    5. Suckers and water sprouts

B. Understand reasons for pruning
    1. Control size
    2. Remove dead, injured and diseased parts
    3. Stimulate growth
    4. Shape

C. Proper time to prune

D. Proper pruning procedures
    1. Jump-cutting
    2. Thinning out
    3. Heading back

E. Maintaining and safely using pruning tools (Core: Hand tools)
    1. Hand pruner
    2. Lopping shear
    3. Pruning saw

F. Pruning and trimming shrubs
    1. Hedge forms
    2. Pruning procedures
        a. Thinning out
        b. Heading back
    3. Maintaining and safely using hedge pruning tools
        a. Hand shears
        b. Electric shears

V. Maintaining Plant Materials

  A. Shrub beds and trees

  B. Flower beds

    1. Fertilizing (Core: Soils, Chemicals)

      a. Time of application

      b. Rate of application

      c. Method of application

        (1) Drip-line method

        (2) Broadcast

    2. Insect and disease control (Core: Chemicals)

      a. Diagnosis

      b. Materials used and the form

        (1) Granular

        (2) Dust

        (3) Wetable powder

        (4) Emulsifiable concentrate

      c. Pesticide application equipment

        (1) Safe operation and maintenance

          (a) Duster

          (b) Hose-on sprayer

          (c) Power sprayer

          (d) Cyclone applicator

          (e) Hand operated compressed sprayer

- 3. Weed control
    - a. Chemical control
    - b. Mulching
- 4. Winterization of a landscape
    - a. Natural injuries
    - b. Human/mechanical injuries
    - c. Rodent injuries

VI. Developing Business Procedures (Core: Business)

- A. Developing a cost estimate
    - 1. Services performed
    - 2. Square footage involved
    - 3. Times service is performed per year
    - 4. Time of service performance
    - 5. Cost of labor and materials
- B. Developing a maintenance agreement
- C. Business start-up costs and fees
    - 1. Local municipality fees
    - 2. Sales tax
    - 3. Pesticide license
    - 4. Insurance
    - 5. Initial equipment and tools

SUGGESTED ACTIVITIES:

1. Review advertisements in daily papers relative to landscape maintenance opportunities; refer to trade magazines for job opportunities in park maintenance. (I)
2. Refer to specific horticulture career information through a computer service system: GIS,

Guidance Information System and CIDS, Career Information Delivery System. (I)

3. Develop a "round table" discussion for students consisting of the local grounds maintenance superintendent for the school. (I)

4. Conduct a field trip to a well maintained landscape; have the landscape maintenance personnel responsible for property to explain: elements of good maintenance, customer relations, expectations of employees, success factors of the business and cautions to be aware of in the landscape maintenance business. (I, II)

5. Demonstrate the calibration of a spreader by placing a price of six mil polyethylene, 10'x10' on a flat surface; apply one swath of fertilizer with spreader; collect fertilizer off poly sheet and weigh sample; calculate the amount of fertilizer that would have been applied to 1,000 square feet by using the sample applied to the 10'x10' poly or 100 square feet. (III)

6. Using a recommended fertilizer application rate, apply fertilizer to a prescribed area on school grounds. Use both organic and inorganic and fertilizers of different analysis and observe the results. (III)

7. Allow students to use department equipment, if necessary, to apply fertilizers to their home grounds. Apply application of fertilizer lesson to BOAC or other community projects. Take advantage of school faculty members or other potential customers wishing assistance on lawn fertilization. Students should be supervised, paid and have their experiences recorded in their SOE record book under supplementary practices. Encourage capable students to solicit their lawn fertilization skills on their own. (III)

8. Encourage students to bring in fertilizer spreaders for repair, maintenance and calibration. (III)

9. Demonstrate the operation and maintenance of a two and four cycle lawn mower. Have students safely operate lawn mowers on selected sites on school grounds. (III)

10. Have students duplicate suggested activities 7, 8 and 9 for all lawn maintenance equipment. It is strongly

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suggested that a selected site be used and a turf laboratory be developed. (III)

11. Develop a crabgrass control and treatment block within the turf laboratory. (III)

12. Follow the Agricultural Extension Service recommendations for lawn insect and disease preventative programs as gleaned from weekly extension bulletins. (III)

13. Demonstrate the use of a hose-on sprayer for the appreciation of emulsifiable concentrate herbicides, specifically for broadleaf weed control. (III)

14. Take advantage of mole damage and apply a control; a field trip to a student or client's home may be necessary for this activity. (III)

15. Demonstrate the calibration of lawn sprinkler with a collection container, recording irrigation time to determine inches of water per unit of time applied. (III)

16. Take advantage of spring clean up of a selected area on school grounds and rake, thatch, fertilize, lime, reseed, roll, mulch, if necessary, and irrigate. (III)

17. Demonstrate and have students participate in pruning practices on trees and shrubs. Use school grounds, field trips to students' homes and individual SOE visits to students' homes to accomplish this activity. Utilize the local County Shade Tree Commission or nurseries and their management personnel to demonstrate pruning techniques. (IV)

18. Demonstration and have students apply fertilizer to shrub beds using a broadcast method and to individual trees using the drip-line method. (V)

19. Demonstrate and have students apply herbicides to shrub beds safely, using a compressed air pump hand held sprayer, stressing target application and proper nozzle. Always stress proper dress, application and clean up after applying all pesticides. (III, V)

20. Demonstrate the use of plastics and mulches for weed control on school, BOAC, home and community-related projects; stress the importance of developing a low maintenance weed control program. (V)

21. Demonstrate wrapping and staking of trees. (V)

22. Use prescribed text book and develop a maintenance cost estimate. Use real situations to reinforce the cost estimate process. (VI)

23. Develop a landscape maintenance agreement and job task sheet. (VI)

24. Introduce a suggested list of landscape maintenance equipment and tools and their current costs. (VI)

25. Encourage part-time and full-time self-employment in landscape maintenance work; encourage employment with established landscape maintenance firms; offer SOE credits in supplementary, production, and placement categories of the New Jersey SOE Student Record Book. (I-VI)

26. Encourage those students with active participation in landscape maintenance to apply for National FFA proficiency awards and State FFA Landscape/Nursery Contest and Weed Identification/Control Contest.

27. Expose students to current articles on landscape maintenance and encourage them to attend local and state sponsored Agriculture Extension Services meetings dealing with nursery, turf, grounds maintenance, and arboriculture topics.

28. Have students complete Horticultural Task Sheets, Landscape Maintenance (24 task sheets) for all skill units of instruction. (III, IV, V)

EVALUATION

Area of Evaluation	Suggested Methods Written	 Performance
1. Identify job opportunities.	X	
2. Understand the elements of a well-maintained land.	X	
3. Maintaining the landscape lawn areas.		X
4. Pruning plant materials.		X
5. Maintaining plant materials.		X
6. Developing business procedures.	X	

SUGGESTED TEXTS:

Landscaping, Section Edition, Ingels, Jack E., Delmar Publishers, Inc., Albany, NY 12205, 1983.

Landscaping Maintenance and Establishment, Student Handbook, teacher Education Series, Volume 9, Number 2s, 1968. The Pennsylvania Department of Agriculture Education, University Park, PA.

REFERENCES:

Equipment Manuals (operating and maintenance guide) for various types and brands of landscape maintenance equipment.

Agriculture Extension Service, weekly bulletins dealing with current pest problems and their controls.

Pesticides for New Jersey, New Jersey Cooperative Extension Service, Rutgers - The State University of New Jersey, 1984.

Pruning Handbook, Sunset Books, Lane Publishing Company, Menlo Park, CA.

BULLETINS:

Making A New Lawn
Better Lawn Seed Mixtures
Your Lawn and Its Care
Pre-emergence Crabgrass Control
Meyer Zoysia and the Zoysias
Lawn Renovation
Lawn Disease Control
Mole Control
Instant Lawn
Pruning Shrubs
Pruning Shade Trees and Repairing Their Injuries
How to Feed and Water Shade Trees
Storm Injured Trees
Care of Evergreens

Insect and Disease Leaflet Set

Weed Control in Home Lawns

Available from: County Agriculture Extension Service

PERIODICALS:

Grounds Maintenance, Intertec Publishing Corp., 9221 Quivira Rd., Overland Park, KS 66215.

Weeds, Trees, and Turf, Harcourt Brace Jovanovich Publications, 7500 Old Oak Boulevard, Cleveland, OH 44130.

AUDIO VISUAL:

Filmstrip:

Elements of Pruning
C10450P, with cassette

Pruning Evergreens
C10273P, 79 frames

Pruning Deciduous Shrubs
C10274P, 45 frames

Pruning Flowering Trees
C10275P, 46 frames

Lawn Weeds - Identification and Control
C10277P, 39 frames and student guide

Steps to a Better Lawn
C10278P, 69 frames and student guide

Controlling Pests of Ornamental Plants
C10431P, with cassette

Understanding and Safe Use of Pesticides
C10515P, 72 frames

Selecting and Handling Pesticides
C10516P, 62 frames

Calibrating and Applying Pesticides Safely
C10517P, 52 frames

Using Power Lawn Mowers Safely
C10159P, 78 Frames

Nasco
901 Janesville Avenue
Fort Atkinson, WI 53538

TRANSPARENCIES:

Landscape Planting and Bed Preparation
C11147P, set of 30

Nasco
901 Janesville Avenue
Fort Atkinson, WI 53538

OTHER:

Horticulture Task Sheets, Landscape Maintenance (24 task sheets)

Department of Agricultural
and Extension Education
The Pennsylvania State University
University Park, PA 16802

Personalized slides of landscapes and landscape practices of local area.

TIME ALLOTMENT:
8 Weeks
5 Days
2, 42 minute periods per day
56 Hours

TURF

PURPOSE

SPECIFIC OBJECTIVES

OUTLINE

I. TURFGRASS CAREERS AND OPPORTUNITIES

II. KINDS OF TURFGRASS AND THEIR USES

III. ESTABLISHING TURFGRASS AREAS FOR ATHLETIC FIELDS, GOLF COURSE TEES AND GREENS, RESIDENTIAL, AND INSTITUTIONAL LAWNS

IV. MAINTAINING TURFGRASS AREAS

V. SAFE OPERATION AND MAINTENANCE OF TURF EQUIPMENT

SUGGESTED ACTIVITIES

EVALUATION

REFERENCES

HORTICULTURE CLUSTER #1

TURF

PURPOSE:

The purpose of this unit is to provide the student with theories and skills necessary to establish and maintain turf. Students should relate theories and skills to personal home surroundings, to the community in which they live, and to school projects. Students should achieve entry skills for golf course, park, and landscape establishment occupations and obtain experiences to enhance post high school education in turf management.

SPECIFIC OBJECTIVES:

1. Identify occupational opportunities in the turfgrass business.
2. Identify kinds of turf and their use.
3. Establish turfgrass areas.
4. Maintain turfgrass areas.
5. Renovate established turf.
6. Diagnose turfgrass problems.
7. Identify, care for and operate turfgrass equipment.

UNIT OUTLINE:

I. Turfgrass Careers and Opportunities
    A. Professional careers
        1. Agronomist
        2. Extension specialist
    B. Semi-professional careers
        1. Golf course superintendent
        2. Athletic field superintendent

3. Landscape contractor
4. Assistant golf course superintendent
5. Turf supplies salesman

C. Non-professional careers

1. Greensworker
2. Landscape gardener
3. Groundskeeper
   a. Occupational opportunities
   b. Educational requirements
   c. Competencies required

II. Kinds of Turfgrass and Their Uses

A. Vegetative characteristics of turfgrass

1. Parts of plant
2. Leaf characteristics
3. Kinds of turfgrass and their uses
   a. Bluegrasses
   b. Fescues
   c. Bentgrasses
   d. Zoysia and Bermuda grasses
   e. Temporary or Nurse grasses
      (1) Ryegrasses
      (2) Redtop
   f. Special use turf
      (1) Crown vetch

B. Commercially produced sod

1. Economic advantage - seeded lawn vs. sodded lawn

III. Establishing Turfgrass Areas for Athletic Fields, Golf Course Tees and Greens, Residential and Institutional Lawns

A. Grading the area

1. Slope
2. Surface drainage
3. Rough and final grading
4. Specific grading considerations
    a. Athletic fields
        (1) Football field
        (2) Soccer field
        (3) Baseball field
            (a) Infield and outfield
            (b) Pitcher's mound
    b. Golf greens and tees

B. Drainage of areas

1. Soil amendments affecting drainage
2. Tile systems
    a. Parallel
    b. Gridiron
    c. Herringbone
    d. Random
3. Swales
4. Drainage beds
5. Vertical drains
6. Outlets and catch basins

C. Soil preparation (Core: Soil)

1. Soil sampling and testing

2. Soil amendments

3. Fertilizer and lime selection and application

4. Off-site soil preparation

    a. Golf course tees and greens

    b. Athletic fields

5. Seed bed preparation

    a. Initial tillage

    b. Final seed bed preparation

D. Seeding new areas

1. Grass and grass mixture selection

2. Seeding procedure

    a. Application and rate

    b. Covering and rolling

    c. Mulching

3. Sprigging or plugging

4. Sodding

E. Caring for newly seeded areas

1. Irrigation   2. Mowing

F. Renovating established turf

1. Evaluation of turf problem

    a. Poor drainage

    b. Compaction

    c. Thatch accumulation

    d. Weed infestation

    e. Undesirable species

2. Thatching

- 3. Aerating
- 4. Top dressing and reseeding

G. Irrigating turfgrass

- 1. Underground sprinkler systems
    - a. Heads flush with soil surface
    - b. Pop-up heads
        - (1) Designing system
        - (2) Factors to consider
            - (a) Water source
            - (b) Water pressure
            - (c) Pipe diameter
            - (d) Friction losses
            - (e) Spacing of heads
            - (f) Controls

IV. Maintaining Turfgrass Areas For Athletic Fields, Golf Course tees and Greens, Residential and Institutional Lawns

A. Fertilization and liming

- 1. Soil sampling
- 2. Interpreting soil test recommendations
- 3. Selecting fertilizers and lime materials
    - a. Forms of fertilizer
    - b. Availability of fertilizer
- 4. Calibration and application
- 5. Time of application
- 6. Other turf considerations for fertilization
    - a. Type of turfgrass

        - b. Use
        - c. Frequency of irrigation
- B. Mowing
    - 1. Mower selection
        - a. Rotary mower
        - b. Reel mower
        - c. Flail mower
        - d. Gang-reel type mower
        - e. Reel greens mower
    - 2. Height of cut
        - a. Species of turfgrass
        - b. Use of turfgrass
            - (1) General use areas
            - (2) Golf greens and aprons
            - (3) Golf tees
            - (4) Fairways and roughs
            - (5) Athletic fields
        - c. Frequency of mowing
        - d. Prevention of grain development
        - e. Clippings
- C. Watering
    - 1. Frequency
    - 2. Rate of application
    - 3. Time of application
    - 4. Syringing
- D. Special practices

1. Aeration
2. Thatching
3. Repairing golf ball marks
4. Raking sand traps
5. Changing cups on golf green
6. Replacing divots

E. Controlling turfgrass pests

1. Broadleaf weeds
    a. Broadleaf weeds
    b. Narrow-leaf weeds
    c. Annuals
    d. Biennials
    e. Perennials
2. Turfgrass diseases
    a. Helminthosporium leafspot
    b. Rust
    c. Pythium blight
    d. Dollar spot
    e. Fairy ring
    f. Brown patch
    g. Slime molds
    h. Snow molds
    i. Powdery mildew
    j. Nematodes
3. Turfgrass insect pests
    a. Ants
    b. Grubs
    c. Chinch bugs
    d. Sod Webworms

F. Non-agricultural practices

   1. Marking a baseball field

   2. Marking a football field

V. Safe Operation and Maintenance of Turf Equipment (Core: Small Engines)

   A. Mowers

   B. Fertilizer applicators

   C. Aerator

   D. Thatcher

   E. Sprayers

   F. Tractors

      1. Using operating manuals

      2. Performing first echelon maintenance

         a. Fuel system

         b. Lubrication system

         c. Electrical system

         d. Blade sharpening

         e. Machine clean up

SUGGESTED ACTIVITIES:

1. Visit local golf course and have course superintendent discuss opportunities and the competencies needed for turfgrass careers. (I)

2. Refer to specific horticulture career information through a computer service system: GIS, Guidance Information System, and CIDS, Career Information Delivery System. (I)

3. Refer to trade magazines for job opportunities. (I)

4. Grow samples of turfgrass seed in 6-inch pots for identification and study of individual characteristics. (II)

5. Establish a turf laboratory consisting of plots approximately 6' x 12'. Plant different species to each plot for observation and future maintenance practices particular to each species. (II, III, IV)

6. Using the school grounds, establish a Zoysia or Bermuda turfgrass planting in a high student traffic area; observe the resistance to traffic-wear. (II, III, IV)

7. Establish crown vetch plantings on sloped areas where regular maintenance practices are not practical. (II, III, IV)

8. An ideal activity, if a space requirement is not a problem, is to establish a golf course laboratory. Specifications for such a laboratory: 700 square feet of green; 1/4 acre of fairway and rough which would include 150-200 square feet of a tee area. Such a laboratory lends itself to the planting of different grass species, maintaining the species to their particular use, establish an irrigation system, all of which gives the students an ideal situation to practice turfgrass skills. (II, III, IV)

9. Encourage interested students to gain employment at local golf courses, cemeteries, industrial complexes, parks, and housing developments for SOE project credit. (III, IV)

10. Have students develop a collection of lawn weeds. Weeds are transplanted into pots, labeled and their control listed.

11. Pre-emergence crabgrass control and post-emergence broad leaf weed controls should be demonstrated.

12. Prescribed Horticulture Task Sheets, Turfgrass (25 task sheets) should be used for all skill units of instruction. (III, IV)

13. Students should be encouraged to participate in the State FFA Weed Identification and Control Contest. (IV)

14. Visit local commercial sod farm. Have students view industry from producer and consumer standpoint.

EVALUATION

Area of Evaluation	Suggested Method Written	 Performance
1. Identify turfgrass opportunities in the turfgrass business. (I)	X	
2. Identify kinds of turf and their uses. (II)	X	X
3. Establish turfgrass areas. (III)		X
4. Maintain turfgrass areas. (IV)		X
5. Renovating established turf. (IV)		X
6. Control turfgrass pests. (IV)	X	X
7. Care and operation of equipment. (V)	X	X

SUGGESTED TEXTS:

Turfgrass Maintenance and Establishment. Department of Agriculture and Extension Education, The Pennsylvania State University, University Park, PA 16802.

Greenskeeping. Department of Agricultural and Extension Education, The Pennsylvania State University, University Park, PA 16802.

REFERENCES:

Our Soils and Their Management, Roy L. Donahue, 1961, The Interstate Printers and Publishers, Inc., Danville, IL.

Agriculture Extension Service, weekly bulletins dealing with current pest problems and their controls.

Pesticides for New Jersey, New Jersey Cooperative Extension Service, Rutgers - The State University of New Jersey, 1984.

Equipment Manuals (operating and maintenance guide) for various types and brands of landscape maintenance equipment.

Groundkeeping Equipment, Volume 1 and 2, AAVIM, Athens, GA, 1974.

BULLETINS:

Making A New Lawn
Better Lawn Seed Mixture
Your Lawn and Its Care
Pre-emergence Crabgrass Control
Meyer Zoyia and the Zoysias
Lawn Renovation
Lawn Disease Control
Mole Control
Instant Control
Insect and Disease Leaflet Set
Weed Control in Home Lawns

Available from: County Agriculture Extension Service

PERIODICALS:

Ground Maintenance, Intertec Publishing Corp., 9221 Quivira Road, Overland Park, KS 66215.

Weeds, Trees, and Turf, Harcourt Brace Jovanovich Publications, 7500 Old Oak Boulevard, Cleveland, OH 44130.

AUDIO VISUALS:

Calibrating and Applying Pesticides Safely
C10517P, 52 frames.

Exploring Turfgrass Occupations, 30 slides, Ohio Agriculture Education Curriculum Materials, Ohio State University, Room 254, 2120 Fyffe Road, Columbus, OH 43210.

Lawn Weeds - Identification and Control
C10277P, 39 frames and student guide

Selecting and Handling Pesticides
C10516P, 62 frames.

Steps to a Better Lawn.
C10278P, 69 frames and student guide.

Understanding and Safe Use of Pesticides
C10515P, 72 frames.

Using Power Lawn Mowers Safely
C10159P, 78 frames.

Nasco
901 Janesville Avenue
Fort Atkinson, WI 53538

OTHER:

Horticulture Task Sheets
Turfgrass (25 task sheets)

Department of Agricultural & Extension Education
The Pennsylvania State University
University Park, PA 16802

All About Lawns - Ortho, Midwest/Northeast
Hobar Publishers, 1234 Tiller Lane
St. Paul, MN

Turf & Garden Fertilizer Book
The Fertilizer Institute
Hobar Publishers, 1234 Tiller Lane
St. Paul, MN

TIME ALLOTMENT: 8 weeks, 5 days per week
2, 42 minute periods per day
56 hours

FLORICUTLURE: FLORISTRY

PURPOSE

SPECIFIC OBJECTIVES

OUTLINE

- I. CAREER OPTIONS
- II. IDENTIFICATION OF PLANT MATERIALS
- III. CARE AND HANDLING POTTED PLANTS
- IV. CARE AND HANDLING CUT FLOWERS
- V. PRINCIPLES OF DESIGN
- VI. ELEMENTS OF DESIGN
- VII. BOW MAKING
- VIII. CORSAGE CONSTRUCTION
- IX. ARRANGEMENTS
- X. WEDDINGS
- XI. BASIC RETAILING
- XII. INTERIOR PLANTSCAPING

SUGGESTED ACTIVITIES

EVALUATION

REFERENCES

FLORICULTURE: FLORISTRY

PURPOSE:

The purpose of this unit is to provide the student with the information and learning activities necessary to develop basic knowledge and skills in retail floristry. Students should achieve job entry level skills for the retail florist shop and supervised occupational experience programs.

SPECIFIC OBJECTIVES:

1. Identify 35 major cut flowers and decorative foliage.
2. Explain the correct procedure for unpacking and storing cut flowers.
3. Explain the correct procedure for handling potted plants in the flower shop.
4. Identify and explain the basic principles and elements of design.
5. Prepare a suitable bow for a variety of floral decorations.
6. Correctly wire flowers and foliage for use in a variety of floral decorations.
7. Prepare a single-flower corsage and boutonniere.
8. Prepare a multiple-flower (3 or more) corsage from a variety of fresh and/or everlasting floral materials.
9. Prepare an orchid corsage.
10. Identify a variety of floral design mechanical aids.
11. Prepare a fresh-flower table arrangement.
12. Decorate and package a potted flowering plant for sale.
13. Assist in the preparation of wedding flowers.
14. Take a telephone order.

15. Transact an over-the-counter sale, ring the purchase on the cash register and make change.

16. Calculate and figure price, markup and net profit for various floral designs.

17. Demonstrate progress toward a possible vocational choice in the area of Floriculture.

18. Prepare a small arrangement of dried flowers.

19. Prepare a small arrangement of silk flowers.

20. Demonstrate an ability to diagnose house plant problems and suggest corrective measures.

21. Assist in the preparation of funeral baskets and sprays.

22. Identify 40 major foliage plants sold in New Jersey.

23. Identify 25 major flowering potted plants sold in New Jersey.

24. Develop an understanding of and design a retail florist shop.

25. Develop an understanding of pricing, markup and profit.

26. Develop an understanding of the differences and proper uses of advertising and publicity.

27. Understand the procedures and problems involved with delivery.

28. Demonstrate the proper use of flowers for the dinner table.

29. Understand and discuss facts about servicing a wedding.

30. Classify, understand and communicate facts about mass, form, line and filler flowers.

31. Construct, critique and discuss the different types (shapes) of floral designs as assigned by instructor.

32. Explain the use of color in general and as it relates to floral design.

33. Explain and demonstrate the different methods of preserving flowers and foliages.

34. Understand and demonstrate the principles of displaying merchandise.

35. Identify and explain the proper use of various floral containers and bases.

36. Identify and explain about sizes and use of florist wire.

37. Identify and explain about sizes, grades, and uses of floral ribbon and netting.

38. Identify and explain use of various mechanical aids used in floral design.

39. Describe monochromatic color as it relates to floral design.

40. Describe analogous color as it relates to floral design.

41. Describe complimentary and split complimentary as it relates to floral design.

42. Describe triadic color scheme as it relates to floral design.

43. Discuss and construct various floral designs appropriate for major holidays.

44. Explain the use of various wire services available in the florist industry, their advantages and disadvantages.

UNIT OUTLINE:

I. Career Options

  A. The florist industry

    1. National

    2. New Jersey

  B. Duties and responsibilities of floral shop workers

  C. General employment considerations

  D. Educational requirements

II. Identification of Plant Materials
   - A. Foliage house plants
   - B. Potted flowering plants
   - C. Cut flowers and decorative foliage

III. Care and Handling Potted Plants
   - A. Basic plant requirements (Core: General Plants)
   - B. Environmental control
   - C. Handling the potted plant shipment
   - D. Recommendations for growing potted plants in the home
   - E. Diagnosing potted plant problems
   - F. Decorating potted plants

IV. Care and Handling Cut Flowers
   - A. Receiving the shipment
   - B. Unpacking and conditioning
   - C. Cooler care
   - D. Special storage considerations

V. Principles of Design
   - A. Emphasis
   - B. Balance
   - C. Proportion
   - D. Rhythm
   - E. Harmony
   - F. Unity

VI. Elements of Design
   - A. Line
   - B. Pattern

- C. Form
- D. Texture
- E. Color

VII. Bow Making

- A. Ribbon sizes
- B. Construction techniques
- C. Bows for various occasions

VIII. Corsage Construction

- A. Wiring
  - 1. Sizes and uses
  - 2. Techniques
- B. Taping
- C. Corsage accessories
- D. Boutonniere
- E. Single-carnation corsage
- F. Multiple-flower corsage
- G. Orchid corsages
- H. Standard mum corsage
- I. Wrist corsage
- J. Body flowers

IX. Arrangements

- A. Containers
- B. Floral foam and mechanical aids
- C. General design rules and aids
- D. General occasion arrangements
- E. Funeral flowers

  - F. Seasonal designs
  - G. Preserving flowers
- X. Weddings
  - A. Brides' flowers
  - B. Attendants' flowers
  - C. Flowers for special guests
  - D. Flowers for the church
  - E. Flowers for the reception
  - F. Servicing
- XI. Basic Retailing (Core: Business Management)
  - A. Establishing and maintaining displays
  - B. Sales techniques
  - C. Making telephone sales
  - D. Using the floral service companies
  - E. Ordering supplies and materials
  - F. Pricing
  - G. Shop layout
  - H. Equipment
- XII. Interior Plantscaping
  - A. Plant materials
  - B. Acclimatization
  - C. Lighting
  - D. Watering and fertilization
  - E. Soil
  - F. Temperature
  - G. Heating, ventilation and air conditioning
  - H. Pest control

SUGGESTED ACTIVITIES:

1. Have students employed in a related area. (I-XII)
2. Establish a micro-production unit making students responsible for planning, maintenance and sale of crops produced. (I-XII)
3. Have students propagate plants from seeds, cutting, separation and layering. (III)
4. Each student will make various floral arrangements emphasizing construction, line and focal point. (V-VI)
5. Have students enter FFA contests related to the various areas of Floriculture. (I-XII)
6. Take a field trip and observe prices, supplies and procedures at a wholesale florist supply company. (XI)
7. Using a school display case, prepare a window display for selling flowers in a retail shop. (XI)
8. Use the teleprompter to stimulate flower order taking. (XI)
9. Have students take orders for proms and other school activities and fill these orders as a money-making project. (XI)
10. Have each student design some type of scheduling method for year-round production of greenhouse plants. (III, IV, XII)
11. Raise and sell seasonal crops such as potted chrysanthemums and poinsettias and force bulbs for spring sales. (III)
12. Publish a pamphlet to inform the public on the proper procedure for indoor bulb forcing and caring for potted flowering plants and/or cut flowers. (III)
13. Subscribe to several publications representing different phases of the Floriculture industry and have students responsible for reporting on new developments and techniques each month. (I-XII)

14. Survey the school horticultural facilities and recommend a safety committee whose responsibility it is to see that safety regulations are carried out. (I-XII)

15. Select several indoor areas within the school district, have the students recommend various foliage plants to be grown there, install the plants and assign several students to maintain them. (XII)

16. Have students maintain running inventories of supplies and materials which are used in the flower shop. (V, VI)

17. Have students make a booklet of flower and/or plant arrangements from magazines and critique them for proper principles of design.

18. Have students plan their own shop from selecting a name and logo to floor layout and interior design. (XI)

19. Have students do a wholesale/retail sheet with each of their arrangements to determine proper (retail) selling price. (IX, XI)

20. Have a group of students attend Florist Society Convention and design school. (I-XII)

21. List ideas for various promotions and monthly display windows. (XI)

22. Develop a budget and outline for a monthly advertising campaign; use prices charged by local newspapers, yellow pages, T.V. stations, etc. (XI)

EVALUATION

Area of Evaluation	Suggested Methods Written	 Performance
1. Explain educational requirements needed for employment in the floriculture industry. (I)	X	
2. List the requirements for plant growth. (III)	X	
3. List the requirements of a good growing media. (III)	X	
4. Identify soil amendments. (III)		X
5. Identify nutrient deficiency symptoms of potted plants. (VII)	X	X
6. Demonstrate hand watering. (XII)	X	X
7. Explain correct quantity of water to apply. (III)	X	X
8. Identify major plant pests. (III)		X
9. FFA Record Book. (XI)	X	
10. Packaging and shipping potted plants. (III)	X	X
11. Packaging and shipping cut flowers. (IV)	X	X
12. Identify 40 foliage plants. (II)		X
13. Identify 25 flowering potted plants. (II)		X
14. Identify 35 cut flowers and foliages.		X

	Suggested Methods	
Area of Evaluation	Written	Performance
15. Demonstrate correct procedure for unpacking and storing cut flowers. (IV)		X
16. Explain correct procedure for handling potted plants in the flower shop. (III)	X	X
17. Explain the principles and elements of design. (V, VI)	X	X
18. Bow making. (VII)		X
19. Wiring floral materials. (VIII)		X
20. Corsage construction		
a. Single-flower carnation		X
b. Boutonniere		X
c. Multiple-flower carnation		X
d. Orchid		X
e. Standard chrysanthemum		X
f. Wrist (VIII)		X
21. Identify floral mechanical aids. (VIII, IX)		X
22. Preparing fresh flower container arrangements		
1. Horizontal		X
2. Vertical		X
3. Radiating		X
4. Triangular		X
5. L-shape		X
6. Oriental styles		X
7. Hogarth curve		X
8. Cresent (IX)		X

	Suggested Methods	
Area of Evaluation	Written	Performance
23. Preparing container arrangements using everlasting flowers.		
1. Silk flowers		X
2. Dried flowers (IX)		X
24. Assist in the preparation of wedding flowers. (X)		X
25. Decorate and package potted plants. (III)		X
26. Take a telephone order. (XI)		X
27. Writing an order. (XI)	X	
28. Using the cash register. (XI)		X
29. Calculating mark-up and and net profit. (XI)	X	X
30. Diagnosing potted plant problems and recommending corrective measures. (XII)	X	X
31. Demonstrate progress toward a vocational choice in floriculture through SOEP. (I-XII)		X
32. Lay out a retail florist shop. (XI)	X	X
33. Calculate the retail price of an arrangement. (XI)	X	X
34. Classify flowers according to type. (II)		X
35. Demonstrate different methods of preserving flowers. (IX)		X
36. Explain the different color schemes and the use of color in floral designs. (VI)	X	

		Suggested Methods
Area of Evaluation	Written	Performance
37. Set up a display of florist merchandise. (XI)		X
38. Demonstrate use of proper size ribbon. (VII)		X
39. Demonstrate use of proper size wire. (VIII)		X
40. Define and distinguish between advertising promotion and publicity. (XI)	X	

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MAGAZINES:

Florist
Florists' Review
Grower Talks
Interiorscope
Flowers and
Greenhouse Grower

OTHER:

Flowers and You booklet and Teachers guide - plus more
Society of American Florist
Sheraton Park Hotel, Washington, DC

Floral Design Worksheets
Colorado State Flower Growers
530 First National Bank Building
Denver, CO

AUDIO VISUAL:

Design Foliage, 41 slides
Cornell Instructional Material Service
6 Stone Hall, Cornell University
Ithaca, NY 14853

FLORICULTURE

GREENHOUSE OPERATION AND MANAGEMENT

PURPOSE

SPECIFIC OBJECTIVES

OUTLINE

I. CAREER OPTIONS

II. GREENHOUSE CONSTRUCTION

III. REGULATION OF THE ENVIRONMENT

IV. GROWING MEDIA

V. PLANT NUTRITION

VI. WATERING

VII. CONTAINERS

VIII. GROWTH CHEMICALS

IX. PEST CONTROL

X. PROPAGATION

XI. PRODUCTION SCHEDULING AND RECORD KEEPING

XII. HARVESTING AND STORAGE

XIII. MARKETING AND DISTRIBUTION

XIV. MAINTENANCE AND OPERATION OF EQUIPMENT, TOOLS AND FACILITIES

XV. CROP PRODUCTION

SUGGESTED ACTIVITIES

EVALUATION

REFERENCES

HORTICULTURE CLUSTER #2

FLORICULTURE: GREENHOUSE MANAGEMENT

PURPOSE:

The purpose of this unit it to provide the student with the information and learning activities necessary to develop basic knowledge and skills in the area of greenhouse management. Students should achieve job entry level skills for greenhouse worker positions and supervised occupational experience programs in greenhouse management.

SPECIFIC OBJECTIVES:

After completion of this unit, students will be able to:

1. Explain the educational requirements necessary for success in a given Floriculture career area.
2. Demonstrate an understanding of the different types of greenhouse structures and their layout.
3. Explain the use of cold frames and lath houses in conjunction with the greenhouse.
4. List the requirements necessary for good plant growth.
5. Explain the difference between a production (greenhouse) environment and a maintenance (home and office) environment.
6. Explain light requirements in terms of intensity and duration for plants being grown in a production environment.
7. Operate timing devices and control lighting for short and long day sensitive plants.
8. Describe the available types of heating and cooling systems which can be used in greenhouse production.
9. Explain the effect of night and day temperatures on plant growth.

10. Discuss the factors of air quality.

11. Explain how the various factors of air quality are maintained for good plant growth.

12. List the requirements of a good growing media for potted plants.

13. Identify the ingredients used to prepare an artificial growing media.

14. Explain and demonstrate the process of soil sterilization.

15. Identify the limitations of the various growing mediums.

16. Identify the nutrients required for plant growth.

17. Calculate the amount of fertilizer needed for an injector stock solution based on the ppm of nitrogen to be applied and the ratio of the injector.

18. Suggest fertilizer and lime applications for various crop and plant growth situations.

19. Identify the major nutrient deficiency symptoms.

20. Explain why and when leaching is necessary.

21. Demonstrate proper hand application of water.

22. Explain the correct quantity of water to apply.

23. Explain the layout of automatic watering systems.

24. Identify factors that would reduce the quality of water.

25. Select the appropriate container for a particular plant or crop.

26. Understand, apply and explain the use of growth regulating chemicals.

27. Identify major plant pests.

28. Explain proper greenhouse sanitation.

29. Demonstrate safe pesticide handling and use.

30. Demonstrate proficiency in attaining pesticide applicator licensing.

31. Demonstrate an ability to propagate plants by seed, cuttings, layering and separation.

32. Explain the procedures involved in planning a greenhouse crop so that production will be in line with seasonal demand for the finished product.

33. Demonstrate an understanding of recordkeeping by keeping an up to date and detailed FFA project record book.

34. Explain how potted plants should be packaged and handled during harvesting and shipment.

35. Explain how cut flowers should be handled during harvesting and shipment.

36. Recognize the market possibilities in the local area for a given horticulture crop.

37. Identify tools and equipment used in greenhouse crop production.

38. Explain the routine maintenance procedures for greenhouse equipment and facilities.

39. Demonstrate an understanding of the production requirements for the major floriculture crops produced in the local area.

40. Identify 25 major bedding plants grown in New Jersey.

41. Identify 40 major foliage plants propagated and/or sold in New Jersey.

42. Identify 25 major flowering potted plants grown and sold in New Jersey.

43. List advantages and disadvantages of the different types of greenhouse benches.

44. Prepare growing media for different types of greenhouse crops.

45. Transplant seedlings and rooted cuttings.

46. Explain the reasons for and demonstrate pinching and disbudding of specific greenhouse crops.

47. Describe the types and uses of different automatic watering systems commonly used in greenhouses.

48. Develop a crop rotation for a year of greenhouse production.

49. Understand, explain and demonstrate the methods of controlling greenhouse humidity.

50. Do a simple plumbing exercise in the greenhouse.

51. Clean and disinfect tools, pots and working surfaces.

52. Wire and explain operation of thermostats and cycle timers.

53. Do glazing on a greenhouse.

54. Identify and discuss mechanical and electrical safety as it applies in greenhouse operation.

UNIT OUTLINE:

GREENHOUSE OPERATION AND MANAGEMENT

I. Career Options

   A. The greenhouse production industry

   B. Duties and responsibilities of greenhouse workers

   C. General employment considerations

   D. Educational requirements

II. Greenhouse Construction

   A. Purpose of structure

   B. Types of greenhouses (structures)

   C. Glazing materials

   D. Benches and beds

   E. Floors and walks

   F. Auxiliary structures

III. Regulation of the Environment

   A. Requirements for plant growth

   B. Light

      1. Intensity   2. Duration   3. Quality

   C. Temperature control

        1. Conventional heating
        2. Solar heating
        3. Energy conservation
        4. Ventilation
        5. Cooling systems
    D. Air quality
        1. Humidity
        2. Carbon dioxide/oxygen
        3. Pollutants

IV. Growing Media (Core: Soils)
    A. Functions
    B. Composition
    C. Limitations of field soil
    D. Ingredients used to prepare artificial growing medias
    E. Limitations of artificial growing media
    F. Soil sterilizations

V. Plant Nutrition (Core: General Plants)
    A. Essential elements
    B. Functions
    C. Types of fertilizer
    D. Methods of application
    E. Frequency and rate of application
    F. Adjusting soil acidity
    G. Soluble salts

VI. Watering
    A. Functions of water
    B. Moisture stress

- C. Frequency and rate
- D. Methods of application
- E. Water quality

VII. Containers

- A. Cell packs
- B. Individual pots
- C. Sterilization
- D. Transplanting

VIII. Growth Chemicals

- A. Functions
- B. Types of chemicals

IX. Pest Control (Core: Plant Problems)

- A. Greenhouse sanitation
- B. Pest identification
- C. Pesticide safety
- D. Methods of application
- E. Pesticide applicator licensing

X. Propagation (Core: General Knowledge)

- A. Sexual
    - 1. Scarification
    - 2. Stratification
- B. Asexual
    - 1. Leaf cuttings
    - 2. Air-layering
    - 3. Stem cuttings
    - 4. Separation

XI. Production Scheduling and Recordkeeping

- A. Growing space
- B. Market demand
- C. Developing a cropping chart

- D. Ordering supplies and materials
- E. Budgeting
- F. Computer programs

XII. Harvesting and Storage

- A. Factors influencing cut-flower storage life
- B. Preharvest handling
- C. Harvesting
- D. Cold storage
    - 1. Wet
    - 2. Dry
- E. Flower preservatives

XIII. Marketing and Distribution (Core: Business Management

- A. Methods of selling
- B. Shipping procedures

XIV. Maintenance and Operation of Equipment, Tools and Facilities

- A. Servicing and maintaining electrically-operated equipment
- B. Maintaining fertilizer proportioners
- C. Basic plumbing installations
- D. Installing, repairing and maintaining glazing
- E. Painting
- F. Servicing pad coolers
- G. Bench construction
- H. Operating shading systems
- I. Basic heating system maintenance
- J. Other

XV. Crop Production

- A. Major crops

    1. Potted chrysanthemums
    2. Poinsettia
    3. Easter lily
    4. Geraniums
    5. Spring flowering bulbs
    6. Bedding plants

B. Other crops
    1. Azalea forcing
    2. Hydrangea forcing
    3. Cyclamen
    4. Cineraria
    5. Calceolaria
    6. Christmas cactus
    7. Streptocarpus
    8. African violet
    9. Orchids
    10. Rieger begonia
    11. Kalanchoe
    12. Foliage and succulent plants
    13. Cut flowers
        a. Chrysanthemum
        b. Carnation
        c. Snapdragon
    14. Vegetable production
        a. Tomato b. Cucumber

C. Production considerations
    1. Description
    2. Cultivars

3. Production requirements
    a. Containers
    b. Growing media
    c. Temperature
    d. Light
    e. Water
    f. Fertilizer
    g. Growth control
    h. Pest control
4. Harvesting
5. Scheduling

SUGGESTED ACTIVITIES:

1. Have students employed in a related area. (I)
2. Establish a micro-production unit making students responsible for planning, maintenance and sale of crops produced. (III-XIII, XV)
3. Have students attend a growers' marketing meeting to observe problems and marketing trends. (XIII)
4. Conduct a field trip to a large commercial greenhouse (and/or flower shop) to observe workers in different situations. (I)
5. Assign students preventative maintenance schedules for greenhouse pest control. (IX)
6. Conduct an experiment by lighting one group of plants and not lighting another group. Record the bloom results. (III)
7. Have students setup and use fertilizer proportioners in applying fertilizer to crops. (V)
8. Conduct an experiment to show the effect of growth regulating chemicals on the height of certain crops. (VIII)

9. Have students use plumbing tools to install a greenhouse irrigation system. (XIV)

10. Have students propagate plants from seeds, cutting, separation and layering. (X)

11. Have students enter FFA contests related to the various area of greenhouse management. (XI)

12. Have each student design some type of scheduling method for year-round production of greenhouse plants. (XI)

13. Raise and sell seasonal crops, such as potted chrysanthemums and poinsettias and force bulbs for spring sales. (XV)

14. Experiment with different seed treatments, such as stratification and scarification on different varieties of hard-to-germinate plants and observe the effects on germination percent. (X)

15. Conduct an experiment to show the quality increase with proper disbudding and pinching as compared to plants that were improperly handled. (XV)

16. Subscribe to several publications representing different phases of the Floriculture industry and have students responsible for reporting on new developments and techniques each month. (I-XV)

17. Survey the school horticultural facilities and recommend a safety committee whose responsibility it is to see that safety regulations are carried out. (XIV)

18. Have students maintain running inventories of supplies and materials which are used in the greenhouse (and flower shop). (XI)

EVALUATION

	Suggested Methods	
Area of Evaluation	Written	Performance
1. Explain educational requirements needed for employment in the floriculture industry. (I)	X	
2. Explain the greenhouse structure and its interior design. (II)	X	X
3. Explain the use of a cold frame and lath house. (II)	X	
4. List the requirements for plant growth. (III)	X	
5. Explain the difference between a production vs. a maintenance environment. (III)	X	
6. Explain light requirements. (III)	X	
7. Operation of timing devices. (III)	X	X
8. Demonstrate an understanding of heating systems. (III)	X	X
9. Explain environmental temperature and the effect on plant growth. (III)	X	
10. Explain the factors of air quality. (III)	X	
11. Explain how air quality is maintained. (III)	X	
12. List the requirements of a good growing media. (IV)	X	
13. Identify soil amendments. (IV)		X

Area of Evaluation	Written	Performance
14. Explain soil sterilization. (IV)	X	X
15. Explain the limitations of the various mediums. (IV)	X	
16. Identify the essential plant nutrients. (V)	X	
17. Preparation of stock solutions. (V)	X	X
18. Suggest fertilizer and lime applications. (V)	X	X
19. Identify nutrient deficiency symptoms. (V)	X	X
20. Explain leaching. (VI)	X	
21. Demonstrate hand watering. (VI)	X	X
22. Explain correct quantity of water to apply. (VI)	X	X
23. Explain layout of automatic watering systems. (VI)	X	X
24. Identify water quality factors. (VI)	X	X
25. Selection of containers. (VII)	X	X
26. Use growth regulating chemicals. (VIII)	X	X
27. Identify major plant pests. (IX)		X
28. Identify greenhouse sanitation practices. (IX)	X	X
29. Demonstrate pesticide safety. (IX)	X	X

Area of Evaluation	Written	Performance
30. Demonstrate proficiency toward pesticide licensing. (IX)	X	X
31. Plant propagation. (X)	X	X
32. FFA Record book. (XI)	X	
33. Production scheduling. (XI)	X	X
34. Packaging and shipping potted plants. (XII)	X	X
35. Packaging and shipping cut flowers. (XIII)	X	X
36. Identify marketing possibilities. (XIII)		X
37. Tool identification. (XIV)		X
38. Explain routine maintenance procedures. (XIV)	X	X
39. Explain production requirements for major greenhouse crops. (XV)	X	
40. Identify 25 bedding plants. (XV)		X
41. Identify 40 foliage plants. (XV)		X
42. Identify 25 flowering potted plants. (XV)		X
43. List advantages and disadvantages of the different types of greenhouse benches. (II)	X	
44. Prepare growing media for different types of greenhouse crops. (IV)		X
45. Transplant seedlings and rooted cuttings. (X)		X

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Area of Evaluation	Written	Performance
46. Explain the reasons for and demonstrate pinching and disbudding of specific greenhouse crops. (XV)	X	X
47. Describe the types and uses of different automatic watering systems commonly used in greenhouses. (VI)	X	
48. Develop a crop rotation for a year of greenhouse production. (XV)	X	
49. Understand, explain and demonstrate the methods of controlling greenhouse humidity. (III)	X	X
50. Do a simple plumbing exercise in the greenhouse. (XIV)		X
51. Clean and disinfect tools, pots and working surfaces. (XIV)		X
52. Wire and explain operation of thermostats and cycle timers. (XIV)	X	X
53. Do glazing on a greenhouse. (XIV)		X
54. Discuss and demonstrate mechanical and electrical safety as it applies in greenhouse operation. (III)	X	X

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Williams, George S. Greenhouse Flowers and Bedding Plants for Agribusiness Studies. Danville, IL: The Interstate Printers and Publishers, Inc., 1975.

AUDIO VISUAL:

Greenhouses and Related Structures, 66 slides
Greenhouse Crops, 61 slides

Ohio Agriculture Education Curriculum
Materials Service
Ohio State University, Room 254
2120 Fyffe Road
Columbus, OH 43210

Poinsettia Production, 74 slides

Cornell Institute, Materials Service
6 Stone Hall, Cornell University
Ithaca, NY 14853

OTHER:

Greenhouse Pest Control, 7 worksheets

Ohio Agriculture Education Curriculum
 Materials Service
Ohio State University, Room 254
2120 Fyffe Road
Columbus, OH 43210

UNIT

OLERICULTURE

PURPOSE

SPECIFIC OBJECTIVES

OUTLINE

I. IDENTIFICATION
II. PLANNING AND PREPARATION
III. PLANTING AND CULTIVATION
IV. IDENTIFICATION AND CONTROL OF INSECTS
V. HARVESTING
VI. MARKETING
VII. RECORD KEEPING
VIII. SOILLESS CULTURE

SUGGESTED ACTIVITIES

EVALUATION

REFERENCES

UNIT 1

OLERICULTURE

PURPOSE:

The purpose of this unit is to provide the student with the information and learning activities necessary to develop basic knowledge and skills in the field of olericulture as it relates to the horticulture vegetable grower. Much of the skills and information obtained, however, can be applied to large-scale commercial vegetable production.

SPECIFIC OBJECTIVES:

After completion of this unit, students will be able to:

1. Identify common root, stem, leaf and fruit producing vegetables and herbs.
2. List factors to consider in choosing (location of) a site.
3. Draw a garden plan, to scale, which includes examples of succession planting, companion and intercropping.
4. Select appropriate vegetable varieties for the area.
5. Describe and demonstrate preparation of different texture soils for vegetable production.
6. List and explain characteristics, advantages and disadvantages of different soil amendments.
7. Calculate the amount of fertilizer and/or lime needed, given soil test results.
8. Use a hardiness map and information on seed package to determine planting dates for vegetables.
9. Name at least five vegetables that are started indoors as transplants.
10. Explain and demonstrate how to harden off seedlings.
11. List steps and demonstrate sowing seeds.

12. Water a newly sown seedbed and seedlings.

13. List advantages and disadvantages of mulching and list three types of mulch.

14. Name two organic methods of weed control.

15. Safely apply herbicides to label directions.

16. Identify at least six insect pests which attack vegetable crops and the plants which they attack and chemicals which kill them.

17. Identify diseased plants.

18. List at least four methods of organic pest control.

19. Safely apply insecticides and fungicides according to label directions.

20. List eight safety precautions to follow when applying pesticides.

21. Determine proper harvest stage of various vegetables.

22. List ideal storage conditions for different vegetable crops.

23. List advantages for packaging vegetables.

24. Grade vegetables for consolidation standards.

25. Outline the possible avenues of distribution and the factors affecting each.

26. Explain how vegetables are grown hydroponically and describe advantages and disadvantages of this type of culture.

27. Properly take a soil sample, prepare it for analysis and interpret the soil test results.

28. Discuss watering techniques used in vegetable production.

29. List and develop an understanding of major characteristics of recommended vegetable varieties for New Jersey.

30. List recommended herbicides, fungicides and insecticides for home and commercial production.

31. Develop a schedule of timing, depth and spacing requirements for vegetables in New Jersey.

UNIT OUTLINE:

I. Identification (Core: General Knowledge)
    A. Root vegetables
    B. Stem and leafy vegetables
    C. Fruit producing vegetables
    D. Herbs

II. Planning and Preparation
    A. Site selection-factors
        1. Water supply
        2. Soil (well-drained loam)
        3. Sun (at least 8-10 hours per day)
        4. Slope
        5. Convenience
    B. Site plan
        1. Crops and amounts to be grown
            a. Crops adapted to types of soil available
            b. Acreage (space) required
            c. Labor requirements--planting, thinning cultivating, pest control, harvest and marketing
            d. Rotation, companion and succession crops
            e. Summer green manuring crops
            f. winter cover crops
            g. Use - fresh market, processing or winter storage
        2. Selecting seed varieties
            a. Recommendations for the area
            b. Early or late crop

      c. Market preference
      d. Fresh market or storage
      e. Hybrid
      f. Disease resistant
      g. Fresh (germination tests)
      h. Days to maturity
      i. Hardiness zone

C. Machinery

  1. Soil preparation
      a. Tractor
      b. Plow
      c. Disc or harrow
      d. Cultivator
      e. Fertilizer distributor
      f. Cultipacker or roller
      g. Lime spreader
      h. Bedmaker (intensive forms)
      i. Deep tiller
  2. Spraying or dusting equipment for pest control
  3. Weed control equipment
  4. Irrigation equipment
  5. Trucks for marketing - flat trailers for bringing produce in from the field

D. Soil preparation (Core: Soil)

  1. Ideal soil - loam
      a. Good drainage
      b. Good soil texture

    - c. Supply of organic matter
    - d. pH range of 6.3 to 7.0 for most vegetables
  - 2. Soil testing
  - 3. Amendments
    - a. Organic matter
      - (1) Improves texture, drainage and aeration in day soils
      - (2) Holds moisture and nutrients in sandy soils
      - (3) Types - cover crops, manure, compost, peat moss, sawdust
    - b. Composting
    - c. pH adjustment
      - (1) Lime to increase pH
      - (2) Gypsum or sulphur to decrease pH
      - (3) Calculating the amount needed to adjust pH
    - d. Fertilizing
      - (1) Fertilizer analysis (amounts of nitrogen, phosphorus and potassium) on bag
      - (2) Calculating amount of fertilizer needed
      - (3) Application - broadcasting, sidedressing, banding, foliar spraying

- III. Planting and Cultivation
  - A. Determining planting time
    - 1. Last frost-free date
    - 2. Hardiness zones
    - 3. Cool weather vs. warm weather plants
  - B. Planting

1. Sowing indoors for transplants
    a. Plants commonly grown as transplants
    b. When to start (4-8 weeks before transplanting)
    c. Light, porous potting media
    d. Techniques for watering and fertilizing seedlings
    e. Transplanting seedlings into flats, peat pots or market packs
        (1) When
        (2) Techniques
    f. Hardening off
        (1) Lower temperature over a two week period
        (2) Lower humidity and water less frequently
        (3) If sown in flats, cut square around plant to form tighter root ball
        (4) Cold frames for hardening off
    g. Transplanting to the field
        (1) Technique - equipment
        (2) Major problems
2. Sowing seed outdoors
    a. Harrow or rake to form firm seedbed
    b. Planting
        (1) Equipment
        (2) Number of seeds per foot of row
        (3) Distance between rows
        (4) Depth of planting
    c. Soil contact

- d. Watering
- e. Thinning

C. Irrigation

1. Amount (one inch per week)
2. Soak to depth of six inches to avoid shallow roots
3. Techniques
    - a. Sprinklers
    - b. Hose
    - c. Trench or ditch
    - d. Trickle irrigation

D. Mulching

1. Advantages and disadvantages
2. Types
    - a. Black plastic
    - b. Grass clippings
    - c. Straw
    - d. Newspaper
    - e. Leaves
    - f. Sawdust
    - g. Other

E. Weed control (Core: Chemicals)

1. Importance
2. Organic methods
    - a. Shallow cultivation
    - b. Mulching
3. Chemical weed control - herbicides
    - a. Most commonly used - Treflan and Dacthal

b. Safety precautions

  (1) Before using, check with County Agent or garden supply retailer for CURRENT information

  (2) ALWAYS follow directions to the letter

  (3) Wear proper protective equipment (gloves, goggles, respirator, etc.)

  (4) Spray early mornings or late afternoon, never on windy days, to avoid drift

  (5) Mix only as much herbicide as will be used (determined by applying only water first)

  (6) Record use

  (7) Cleaning equipment

IV. Identification and Control of Insects and Diseases

  A. Identification (Core: Chemicals and Problems)

    1. Insects

      a. Sucking

      b. Chewing

      c. Boring

      d. Soil borne

    2. Diseases

      a. Bacterial

      b. Fungal

      c. Viral

  B. Organic controls

    1. Cultural

      a. Dispose of crop residue

- b. Rotate crops
- c. Plant treated seeds
- d. Resistant varieties
- e. Use and encourage growth of, strong, healthy plants
- f. eliminate weeds

C. Biological controls

1. Beneficial animals (birds, frogs, toads, turtles, etc.)
2. Beneficial insects (dragonflies, praying mantis, lady bugs, wasps, ground beetles, spiders)

D. Chemical controls

1. Insecticides - define
    - a. Most commonly used, relatively safe
        - (1) Malathion
        - (2) Sevin
2. Fungicides - define
    - a. Commonly used
        - (1) Zinel
        - (2) Maneb
        - (3) Captan
3. Safety precautions
    - a. Check with county agent and/or garden supply retailer for CURRENT information
    - b. Spray early morning, late afternoon and on windless days to avoid drift
    - c. Mix only as much pesticide as is needed
    - d. Read label and follow mixing, use and safety directions
    - e. Check to see how close to harvest date the sprays or dusts can be applied

        - f. Always apply pesticides only to those crops for which they are recommended
        - g. Apply only the amount specified on the label
        - h. Wash all treated vegetables before eating
        - i. Use proper protective equipment
        - j. Record use of pesticides
    - 4. Applications
        - a. Sprayers
        - b. Dusters
        - c. Hose attachments
    - 5. Cleaning equipment
        - a. Pesticides
        - b. Herbicides

V. Harvesting (Core: Horticulture Practices)

- A. Predicting harvest dates
    - 1. Days to maturity
    - 2. Numbers of days from flowering
    - 3. Color
    - 4. How the stem separates from the fruit
    - 5. Sound when thumped
    - 6. Size
- B. Harvesting methods
    - 1. Hand
    - 2. Mechanical

VI. Marketing (Core Unit 11)

- A. Definition: operation and transactions involved in the movement, storage, processing and distribution of goods from producer to consumer

- B. Storage and refrigeration
    - 1. To slow respiration
    - 2. Prevent excess water loss
- C. Processing
    - 1. Packaging
        - a. Protection
        - b. Convenience
        - c. Economy
        - d. Appeal
    - 2. Grading
        - a. To eliminate obviously unsatisfactory items
        - b. Consolidates according to: cultivar, size, appearance, defects, quality
- D. Distribution
    - 1. Farmers' markets
    - 2. Roadside stands
    - 3. Pick-Your-Own
    - 4. Terminal markets

VII. Record Keeping - Profit-Loss Statement

VIII. Soilless Culture - Hydroponics

- A. Define
    - 1. Roots suspended in water
    - 2. Wire mesh for support
    - 3. Nutrients added to water
    - 4. Aerated water provides oxygen
- B. Advantages

1. Grown where no or poor soil exists

2. Uniform control equals uniform results

3. Able to make immediate adjustments in nutrient levels

4. Soil-borne pests and diseases not a problem

C. Disadvantages

1. Smaller margin for error in nutrient applications

2. Needs plentiful water supply

SUGGESTED ACTIVITIES: (Cross referenced to Unit Outline)

1. Bring in live vegetables for identification. (I)
2. Enter State FFA Fruits and Vegetable Contest. (I-VI)
3. Plan and plant a school "display" vegetable plot. (I-V)
4. Encourage first-year students without SOE projects to start a vegetable garden and expand to larger scope in subsequent years. (I-VI)
5. Send away for seed catalogs and practice selecting vegetable varieties. (I, II)
6. Start vegetables for transplanting in greenhouse. (II)
7. Construct cold frame for school use. (II)
8. Use different methods of mulching in school "display" garden. (III)
9. Demonstrate mixing, loading and applying herbicides on school garden - allow competent student to apply herbicides with supervision. (III, IV)
10. Have all students record pesticide usage in logs. (IV)
11. Make a collection of common insect pests and compile information concerning time and method of control. (IV)
12. Show examples of diseased and infested plants. Determine the causal agent and its control. (IV)
13. Demonstrate proper mixing and loading of insecticides and fungicides on school grounds. (IV)
14. Demonstrate and encourage the safe cleaning of equipment, disposal of unused pesticide materials and containers and the safe storage of chemicals. (IV)
15. Set up a pesticide safety presentation to be given to the community during open house, etc. (IV)
16. Apply organic control methods of prevention in school display garden. (IV)

17. Have students work up a Food for America presentation on "how vegetables are grown" - show to schools. (I-VI)

18. Harvest, grade and display vegetables from display garden. (V, VI)

19. Visit Newark farmers market and other market outlets. (VI)

20. Visit a commercial vegetable grower in New Jersey.

21. Guest speakers from Farmers' Cooperative Boards or Small Businesses Administration.

22. Visit a hydroponics greenhouse.

23. Set up an experimental small-scale hydroponics unit in the classroom or greenhouse. Have students keep records on how care and activities differ from regular vegetable production.

24. Visit greenhouses (experimental and/or commercial) where vegetables are grown hydroponically.

EVALUATION - UNIT 1

		Suggested Method	
	Area of Evaluation	Written	Performance
1.	Identify common root, stem, leaf and fruit producing vegetables and herbs. (I)	X	X
2.	List factors to consider in choosing a site. (I)	X	
3.	Draw a garden plan, to scale which includes examples of succession planting, companion and intercropping. (II)	X	
4.	Select appropriate vegetable varieties for the area. (II)		X
5.	Describe and demonstrate preparation of different texture soils for vegetable production. (II)	X	X
6.	List and explain characteristics, advantages, and disadvantages of different soil amendments. (II)	X	
7.	Calculate the amount of fertilizer and/or lime needed, given soil test results. (II)	X	
8.	Use a hardiness map and information on seed package to determine planting dates for vegetables. (II)	X	
9.	Name at least five vegetables that are started indoors as transplants. (II)	X	
10.	(Explain and demonstrate how to) harden off seedlings. (II)	X	X
11.	(Describe steps used to) sow seed in the garden. (II, III)	X	X

12.	Water a newly sown seedbed and seedlings. (III)		X
13.	List advantages and disadvantages of mulching and list three types of mulch. (III)	X	
14.	Name two organic methods of weed control. (III)	X	
15.	Safely apply herbicides to label directions. (IV)	X	X
16.	Identify at least six insect pests which attack vegetable crops and the plants which they attack and chemicals which kill them. (IV)		X
17.	Identify diseased plants. (IV)	X	X
18.	List at least four methods of organic pest control. (IV)	X	
19.	Safely apply insecticides and fungicides according to label directions. (IV)		X
20.	List eight safety precautions to follow when applying pesticides. (IV)	X	
21.	Determine proper harvest stage of various vegetables. (IV)		X
22.	List ideal storage conditions for different vegetable crops. (V)	X	
23.	List advantages for packaging vegetables. (V)	X	
24.	Grade vegetables for consolidation standards. (V)		X
25.	Outline the possible avenues of distribution and the factors affecting each. (IV)	X	

26.	Explain how vegetables are grown hydroponically and describe advantages and disadvantages of this type of culture. (VI)	X	
27.	Properly take a soil sample, prepare it for analysis and interpret the soil. List results. (II)		X
28.	Discuss watering techniques used in vegetable production. (III)	X	
29.	List and develop an understanding of major characteristics of recommended vegetable varieties for New Jersey. (II)	X	
30.	List recommended herbicides, fungicides and insecticides for home and commercial production. (IV)	X	
31.	Develop a schedule of timing, depth and spacing requirements for vegetables in New Jersey and use when planting. (II)	X	X

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UNIT

TREE FRUITS

PURPOSE

SPECIFIC OBJECTIVES

OUTLINE

- I. ESTABLISHING AN ORCHARD
- II. APPLE CULTURE
- III. PEAR CULTURE
- IV. PEACH AND NECTARINE CULTURE
- V. PLUM
- VI. CHERRY CULTURE

SUGGESTED ACTIVITIES

EVALUATION

REFERENCES

UNIT 3

TREE FRUITS

PURPOSE:

The purpose of this unit is to provide the student with the information and learning activities necessary to develop basic knowledge and skills in the field of tree fruits.

SPECIFIC OBJECTIVES;

After completion of this unit, students will be able to:

1. List factors to consider in selecting a site for an orchard.
2. List four advantages of dwarf trees.
3. Name and describe two methods of dwarfing.
4. Name and describe three dwarfing rootstocks used in apple culture.
5. List recommended varieties for each of the following tree fruits: apple, pear, peach, nectarine, plum, sweet cherry, tart cherry.
6. Plant tree fruits.
7. List reasons for maintaining a permanent sod cover for tree row middles.
8. List and describe two methods of determining the nutritional needs of an orchard.
9. List five reasons for pruning fruit trees.
10. Name and describe two methods of irrigation.
11. Name, describe and discuss advantages and disadvantages of the various methods of weed control.
12. Identify six common orchard weeds.

13. Describe methods of controlling mice and deer in the orchard.

14. Identify the various stages of development which pesticide applications follow.

15. List four reasons it is important to learn the techniques of budding and grafting fruit trees.

16. Draw an orchard plan, including specific varieties for any of the following: apple, pear, peach, plum, nectarine, cherry.

17. Prune apple, pear, peach, nectarine, plum and cherry trees.

18. List and discuss nutrients that are important in apple development.

19. List the five benefits of fruit thinning and discuss the methods.

20. Name the two fruits chemical thinning can be applied to.

21. Identify the major diseases and insects of orchards and determine an appropriate, safe control for each species.

22. Grade apple, pear, peach, nectarine, plum and cherry.

23. Determine proper time to harvest apple, pear, peach, nectarine, plum and cherry.

24. List market outlets for apple, pear, peach, nectarine, plum and cherry.

25. Identify the major New Jersey varieties of apples.

26. Demonstrate the different types of grafting and budding techniques.

27. Discuss hardiness and compatibility in fruit tree selection procedure.

28. Outline the basic botany and terminology related to tree fruit production.

29. Correctly determine the number of plants per acre required in an orchard.

30. Develop an appreciation of the opportunities for employment in pomolgy.

31. Identify and discuss chemical and mechanical safety in pomology.

UNIT OUTLINE:

I. Establishing an Orchard - General Principles

   A. Site requirements

      1. Size

         a. Adequate space - home

         b. Depends upon intended market - commercial

      2. Full sunlight

      3. Good air drainage

      4. Soil (Core: Soil)

         a. Well-drained

         b. Organic matter (fertile)

         c. Slightly acid pH 5.5-6.5

   B. Dwarf trees

      1. Advantages

         a. Utilize sun better and produce better fruit

         b. Easier to spray, prune and harvest

         c. Begin to produce fruit earlier

         d. Require less space per tree

         e. Production per acre is higher

      2. Methods

         a. Dwarfing rootstock

         b. Interstem method (doubleworking)

         c. Spur-type trees in apples on dwarfing stock produce compact and smaller trees

      3. Dwarf tree - rootstocks

a. Stone fruits - peach, plum, apricot, nectarine and cherry (except sweet cherry) (not extensively produced and are generally unsatisfactory as dwarf; size restricted by extensive pruning)

b. Apple in order of dwarfing effect

(1) M9 greatest dwarfing but poor root system

(2) M26 slightly less dwarfing, better root system

(3) M7 and M106 semi-dwarf

(4) M2 and M111 vigorous, semi-dwarf

c. Peach

(1) Quince A (2) Provence

C. Planting (Core: Horticulture Practices)

1. Recommended varieties

a. Apples d. Cherries

b. Peaches & nectarines e. Plums

c. Pears

2. Certified disease-free, insect and virus free

3. Procedures

a. Late fall - early spring planting

b. Soil test

c. Apply 1/2-2 pounds calcitic limestone mixed with soil at base of planting for apple and peach

d. Dig hole large enough for root system without crowding

e. Plant at same depth it grew in nursery

f. Equal parts topsoil and well-rotted compost - fill hole, pack soil firmly around roots

g. Water thoroughly

4. Permanent sod cover (for tree-row middles)

    a. Reasons - helps prevent soil compaction, decreases water runoff, increase soil-water infiltration rates, minimizes wind/water erosion, maintains or increases soil organic matter content, conserves plant nutrients, makes moving equipment easier during wet periods

    b. Must be mowed to prevent competition with trees

    c. Soil under drip area of trees free of vegetation

D. Care

1. Fertilize and lime (Core: Soil)

    a. Home orchard

        (1) First year - one pound of complete fertilizer (5-10-5 or 8-8-8)

        (2) Second year on - apply fertilizer only when shoots make less than 12-18" growth at 1/2 pound per year of tree age

    b. Commercial

        (1) Soil analysis - fall

        (2) Fertilize 1-2 months before bloom

        (3) Leaf tissue analysis - July 15 - August 15

        (4) The kind, rate, and frequency depend on crop, variety, soil type, soil pH, cultivation practices and results of tests

2. Pruning and training

    a. Reasons (Core: Horticulture Practices)

        (1) To produce attractive, high quality fruit

        (2) It invigorates the tree
        (3) Prevents overbearing
        (4) Increase fruit size
        (5) Aids in control of pests
        (6) Exposes maximum leaf area to sunlight
        (7) Aids in harvesting
    b. When
        (1) Late fall after leaves have fallen
        (2) During winter when weather is mild
        (3) Early spring before growth starts
3. Irrigation - methods
    a. Basin or flood
    b. Furrow hill
    c. Sprinkler
    d. Trickle
4. Weed control
    a. Permanent sod cover for tree row middles
        (1) Vegetation-free zone to drip line
        (2) 1/3-1/2 the orchard floor in cool-season perennial sod cover (fertilize separately from trees)
        (3) Decreases weed seed production
    b. Mechanical weed control (Cores: Chemicals and Problems)
        (1) Methods - plowing, disking and harrowing before planting AND disking, mowing and hand-weeding after trees are planted
        (2) Disadvantages - close cultivation can injure tree trunks, too deep cultivation can destroy roots, can destroy soil structure and reduce organic matter

c. Chemical

  (1) Advantages

    (a) It's effective

    (b) Economical

    (c) Safe, when used correctly

    (d) Eliminates danger of trunk injury

    (e) Eliminates danger of deep cultivation root destruction

    (d) Reduces mouse injury by removing cover

  (2) Types of herbicides

    (a) Residual

    (b) Systemic

    (c) Pre-emergence

    (d) Post-emergence

      - Selective

      - Non-selective

d. Weed identification

  (1) Canada thistle

  (2) Camphorweed

  (3) Dandelion

  (4) Horseweed

  (5) Poison ivy

  (6) Virginia creeper

5. Rodent and deer control

  a. Mice control

    (1) Clear a three foot radius around the base of trunk

    (2) Control ground vegetation with

mowers, disking, or sod-chopping machines

(3) Lethal baits (zinc phosphide)

(a) Trail baiting by hand

(b) Trail builder

(c) Broadcasting bait

b. Deer control

(1) Repellents

(2) Penn State 5-Wire Deer Fence

6. Insect and disease control

a. Pesticide application

(1) Sprayer calibration

(2) Concentrate pesticide application

b. IPM - integrated pest management

(1) Intensive monitoring

(2) Use of selective pesticides at adjusted rates

(3) Use of economic threshold levels

c. Terms for stages of development which pesticide applications often follow:

(1) Dormant

(2) Silver tip

(3) Green tip

(4) 1/2" green

(5) Tight cluster

(6) First pink

(7) Full pink

(8) First bloom

(9) Full bloom

(10) Petal fall

(11) Shuck split

(12) Cover

(13) Pre-harvest

(14) Post-harvest

d. Fungicides

e. Insecticides

        - f. Acaricides (miticides)
    - 7. Honeybees for orchard pollination
        - a. Beekeeper relations
        - b. Bee laws
        - c. Bee colonies
        - d. Hive placement
        - e. Pollinizers
        - f. Pollen insects
- E. Grafting and budding fruit trees
    - 1. Reasons
        - a. Market demand may shift, leaving grower with an unprofitable orchard
        - b. With dwarfing stocks, knowledge of double-working, budding and grafting is essential
        - c. If cultivars are not cross-pollinating properly, graft can effect pollinators on scattered trees
        - d. To correct mistakes in cultivars, after having planted them
        - e. Small acreage growers may wish to propagate their own high-density trees
    - 2. Budding
    - 3. Grafting
        - a. Cleft grafting
        - b. Bark grafting (veneer)
        - c. Whip grafting

II. Apple Culture

- A. Apple identification
- B. Cultivars
    - 1. Recommendations for the area

2. Market to be served
    a. Home gardener - space available, personal tastes
    b. Commercial - wholesale - about five good varieties which ripen successively over a period from 1-3 months
    c. Commercial - roadside/pick-your-own - ten or more varieties for season-spread
3. Viable pollinators - match varieties to get cross-fertilization
4. Desirable characteristics
    a. Annual bearer
    b. Good to very good dessert quality
    c. Very attractive appearance
    d. Relatively pest resistant
    e. Productive and hardy
    f. Good storage and handling quality

C. Planting

1. Hedgerow
    a. Most efficient management system
    b. Adapted to mechanical harvesting and practices
    c. Adaptable to compact, staked, free-standing or trellised trees
2. Tree spacing (Core: Horticulture Practices)
    a. Standard varieties
    b. Dwarf
3. Trellises
    a. Usually M9 or M26, some M7 and M106
    b. Palmette training
    c. Construction

D. Pruning: central-leader system

1. One year old tree
    a. Remove all competing shoots
    b. head back to height of three feet
2. Two year old tree
    a. Select and head back lateral branches
    b. Shape of tree resembles a pyramid
        (1) Receives maximum sunlight on leaves and fruit
        (2) Lower limbs remain vigorous and productive
        (3) Increased fruit production
    c. Corrective pruning
        (1) Remove broken branches
        (2) Remove branches with crotch of less then 45°
    d. Spread limbs to a horizontal plane
3. Three-five year old tree
    a. Remove forked terminals to a single shoot and head back
    b. Head back side shoots
    c. Corrective pruning
    d. Spread limbs to produce a strong framework
4. Five-twelve year old tree
    a. Select 3, 4, or 5 limbs spaced around central leader to produce main scaffold frame
    b. Corrective pruning

E. Pruning: Espalier

F. Apple orchard nutrition

1. Urea - on nitrogen deficient trees (Core: Soil)

    a. Supplements ground applications

    b. Three pounds/100 gallons of water at pink bud, full bloom, petal fall

    c. Improves fruit set and tree vigor

2. Boron - in deficient trees

    a. Aids calcium movement into fruit

    b. Applied at and one week after full bloom

3. Calcium - in deficient trees

    a. Associated with bitter pit and cork in applies

    b. Short term - spray with calcium chloride solution with cover sprays

    c. Long-term

        (1) Lime with calcitic limestone prior to planting

        (2) Topdress with calcitic limestone to maintain pH 6.5

        (3) Apply agricultural gypsum to soils that are deficient in calcium but have pH 6.5

        (4) Determine deficiencies

            (a) Leaf analysis

            (b) Soil test

G. Fruit set

1. Require cross-pollination to set commercial crop

2. Varieties vary in degree of self-fruitfulness

3. Conditions necessary to obtain satisfactory cross-pollination

        - a. Varieties must bloom together or overlap
        - b. Pollinator must have viable pollen
        - c. Varieties close in orchard - no farther than two rows from a pollinator
        - d. Bees present at blooming
        - e. Weeds such as dandelion, mustard and wild radish removed since they attract bees from trees
    - 4. Two strong colonies of bees per acre at blooming time

H. Thinning

- 1. Benefits
    - a. Increases yield
    - b. Improves uniformity and fruit size
    - c. Improves color
    - d. Improves eating quality
    - e. Reduces handling and costs
    - f. Reduces limb breakage
    - g. Promotes tree vigor
    - h. Permits more thorough spraying
- 2. Hand - home orchard - thin to singles 6-8" apart
- 3. Chemical
    - a. (NAA) naphthaleneacetic acid
    - b. (NAD) naphthalacetamide
    - c. (Sevin) carbaryl

I. Diseases (Cores: Chemicals and Problems)

- 1. Black rot
- 2. White rot

3. Cedar apple rust
4. Collar rot (phytophthora)
5. Fire blight
6. Sooty blotch, late scab
7. Powdery mildew
8. European canker
9. Cork and bitter pit, moldy core
10. Scald
11. Blue mold and storage scab

J. Insect and mite pests

1. Apple maggot
2. Codling moth
3. Leafrollers
4. Mites (European red and two-spotted)
5. Plum curculio
6. Rosey and green apple aphid
7. San Jose scale
8. Spotted tentiform leafminer
9. Tufted apple bud moth
10. White apple leafhopper

K. Pesticide recommendations

1. Standard spray schedule
2. Integrated pest management (1PM) schedule
3. Home garden spray schedule

L. Harvesting and storing (Core: Business Management)

1. Determining picking time
    a. Time from full bloom to picking maturity

- b. Change in ground or flesh color
- c. Ease of separation of fruit from spur
- d. Firmness of flesh (pressure tester)

2. Harvesters
   - a. Hand
   - b. Mechanical
3. Grading - color, condition (firmness and soundness), uniformity and freedom from blemishes
4. Judging
5. Sizing
6. Storing
   - a. Temperature
   - b. Humidity
   - c. Ventilation
   - d. Fruit condition
   - e. Controlled atmosphere storing

M. Marketing

1. Grower to retail buyer or consumer
2. Sell to processors
3. Cooperatives
4. Roadside
5. Pick-Your-Own
6. Marketing agencies

III. Pear Culture

A. Varieties

1. Bartlett
2. Bosc
3. Sparlett
4. Anjou
5. Aurora
6. Seckel

B. Planting

1. Hedgerow

    2. Planting distances: 8x12 to 14x24

C. Pruning (Core: Horticulture Practices)

    1. Habit of growth - upright, does not branch freely

    2. Central leader training

        a. Best for dwarf to semi-dwarf trees of 10-11 feet

        b. Requires much labor for spreading and limb tying

        c. Prune as for apple

    3. Three-four leader tree

        a. Tends to fit the tree's natural growth habit

        b. Steps

            (1) Head the nursery whip to 30" at planting

            (2) One year old pruning

                (a) Head three or four topmost vigorous shoots to stiffen and cause branching

                (b) Do not head remaining lower shoots which will form an "undergird" or fill-out the lower part of the tree)

                (c) Remove all dead, broken and crossing branches

            (3) Two year old pruning

                (a) Thin the (3 or 4 chosen) leaders to single upright shoots and head them to 2-1/2 - 3 feet

                (b) Leave side branches unheaded

                (c) Remove all dead, broken and crossing branches

                (d) Can start to stimulate early fruiting by preparing limbs

(4) Three year old to bearing tree

(a) Continue the procedure of thinning each leader to a single shoot and heading it back until final height of 14-15 feet is reached

(b) Remove all dead, broken and crossing branches

(c) Head back or eliminate all old spur systems (fruit production is reduced on spurs older than 4-5 years)

(d) Thin out shoots, leaving enough to replace old spurs with new fruiting wood

D. Pear-orchard nutrition

1. Fertilize with extreme care as too much growth may result in loss due to fire blight

2. Leaf analysis - to diagnose deficiencies

E. Fruit set

1. Require cross-pollination for a good commercial crop

2. Seckel and Bartlett are uncompatible

3. Require honeybees for adequate pollination

4. Keep weed population down to eliminate competition

F. Thinning

1. Hand - to 1 to 2 fruit per spur

2. Chemical - if needed - NAD (Naphthaleneacetamide)

G. Pests

1. Pests

a. European red mite

b. Pear leaf blister mite

            c. Scale

            d. Pear psylla

            e. Plum curculio

            f. Codling moth

            g. Pear scab

            h. Sooty blotch

            i. Fabraea leaf spot

        2. Control recommendations

            a. Home orchard

            b. Commercial orchard

    H. Harvest and marketing (Core: Business Management)

        1. Determining maturity

            a. Color change (color charts)

            b. Change in firmness of flesh (Magness Taylor tester)

            c. Change in soluble solids (refractometer)

            d. Ease with which stem separates from spur

            e. Number of days from full bloom

        2. Marketing

            a. Increasing amounts of pears going into processing

            b. Attractive store display important for fresh market

IV. Peach and Nectarine Culture

    A. Differences and similarities

        1. Nectarines–fuzzless and smooth, greater aroma

        2. Nectarines - less suited to shipping, more

skin cracking and susceptible to curculisxtheyso damage.

3. Appearance of trees, growth responses and bearing habits are all similar

B. Recommended varieties

1. Peach

2. Nectarine

3. Factors in choosing cultivars

a. Type of market to be served

b. Distance to market

c. Adaptability to local soil and climatic conditions

C. Peach and nectarine - Planting

1. Systems

a. On the square

b. California "long" system

c. Hedgerow

2. Spacing - 18-24 feet apart (varieties are self-fruitful

D. Pruning (Core: Horticulture Practices)

1. Steps - open-vase form

a. After planting - prune back to 24-30 inches and prune side branches to stubs with 2-3 buds

b. One year old trees

(1) Remove branches forming narrow angles

(2) Remove limbs below 24 inches height

(3) Remove one of any two branches forming a "Y"

(4) Remove sucker, dead and diseased wood

            - (5) Select three side branches with wide-angle crotches for main framework

        - c. Two year old trees

            - (1) Prune to develop open centers and spreading trees
            - (2) Remove suckers growing up or through center of trees
            - (3) Retain most other one year growth
            - (4) Remove narrow angle and weak crotches

        - d. Three year old and fruit bearing trees

            - (1) Remove weak unproductive, diseased and dead wood
            - (2) Maintain a supply of shoot growth with strong, well-developed fruit buds
            - (3) Prune with thought that peaches are produced on last year's growth in mind
            - (4) Remove all suckers growing straight up
            - (5) Retain shoots growing horizontally and 12-18 inches fruiting shoots
            - (6) Keep trees at a height of 7-8 feet

    - 2. Prune in March
    - 3. Heavy pruning to invigorate old trees

- E. Orchard nutrition and irrigation

    - 1. Nitrogen is nutrient most lacking
    - 2. Leaf analysis to determine deficiencies
    - 3. Peaches require about ten gallons/day/tree by drip and up to 20 gallons/day/tree by sprinkler

- F. Thinning

1. Begin after June drop
2. 6-8 inches apart on a vigorous tree
3. Mechanical - hydraulic or pneumatic limb shakers
4. Hand
5. Chemical - none available

G. Peach and nectarines - Insects and diseases
   1. Insects (Cores: Chemicals and Problems)
      a. Catfacing insects
      b. Green peach aphids
      c. Lesser peach borer
      d. Peach tree borer
      e. Peach silver mite
      f. Mites
      g. San Jose scale
      h. Nematodes
   2. Diseases
      a. Brown rot
      b. Fusicoccum canker
      c. Bacterial spot
      d. Collar rot (phytophthora)
      e. Cytospora canker
      f. Powdery mildew
      g. Rusty spot
      h. Scab
      i. Stem pitting
   3. Control recommendations
      a. Home garden

b. Commercial

4. Winter injury

a. Early before trees are dormant

(1) Avoid late fertilizing and cultivation

(2) Permit late weed and cover growth

b. While tree are dormant

(1) Avoid low areas and those exposed to north winds

c. After the dormant period - fluctuating temperatures

(1) Paint trunk with white reflective material (paint or lime mix)

H. Harvest and marketing (Core: Business Management)

1. Time to harvest

a. Home gardener - pick tree ripe

b. Commercial

(1) If close to consumption center - firm-ripe stage

(2) Ground color change

(3) Taylor-Magness pressure tester

2. Harvesting methods

a. Hand

b. Mechanical

c. Pick-Your-Own

3. Highly perishable - require careful handling

V. Plum Culture

A. Recommended varieties

1. Japanese plums

2. European plums

B. Planting

1. The square - 18 x 22 feet

2. Hedgerow - spaced 8-10 feet in rows, 16-22 feet apart

C. Pruning (Core: Horticulture Practices)

1. Open-center (as peaches) - spreading varieties

2. Center-leader (as apples) - upright varieties

3. Relatively little pruning when young

4. Light pruning of mature trees encourages spur development

D. Fruit set

1. Most Japanese plums are self-unfruitful - require cross-pollination

2. Some European plums are self-fruitful and some are self-unfruitful - it is probably safer to interplant with at least one pollinizing variety

3. Every third tree in every third row should be planted to a pollinizing variety

4. One strong beehive per acre throughout the orchard

E. Thinning

1. Thinning a must - after June drop - by hand

2. Chemical - none at present

3. Mechanical - trunk shakers - done just before full pit hardening

4. 3-4 inches apart

F. Insects and diseases - plum

1. Insects (Core: Chemicals and Problems)

   a. Scale, aphids

- b. Plum curculio
- c. Leafrollers
- d. Oriental fruit moth
- e. Mites
- f. Peach tree borer

2. Diseases
    - a. Brown rot
    - b. Black knot

3. Control recommendations
    - a. Home garden
    - b. Commercial orchard

G. Harvest and Marketing (Core: Business Management)

1. Time to harvest (determining maturity)
    - a. Color index
    - b. Soluble solids
    - c. Fresh firmness

2. Grading and sizing
    - a. Sizing - by weight or size
    - b. Grading - by maturity, color and blemishes

3. Harvesting
    - a. Mechanically
    - b. Hand

4. Bloom should be kept intact

5. Marketing in the east - mostly to local markets, roadside strands for fresh consumption or canning

VI. Cherry Culture

A. Recommended varieties

1. Sweet

2. Tart

B. Planting and pollination

1. Spacing from 15 x 15 feet to 36 x 36 feet depending on variety, vigor and soil

2. Hedgerow

3. Sweet cherries must be interplanted for cross-pollination (Core: Horticulture Practices)

   a. Every third row should be a pollinizing cultivar

   b. Two rows of pollinizer between four rows of cultivar needing pollination

4. Tart cherries are self-fruitful

C. Orchard nutrition and soil management

1. Home - mulch 6-10 inches deep

2. Commercial - sod with strip chemical weed control and trickle irrigation if needed

3. Leaf analysis - to determine deficiencies

D. Cherry - Pruning

1. Tart cherry

   a. Spreading habit - prune like peach

   b. Select 3-4 side branches spaced around main trunk

   c. Cut weak, small side branches back to one bud

   d. Prune lightly for first 6-7 years to correct growth and promote tree symmetry

   e. Older trees - more cutting back is needed to keep tree in bounds and allow light to enter

2. Sweet cherry

        - a. Upright habit - prune like apple
        - b. Select 4-5 main scaffold branches with wide angles
        - c. Retain a central leader
        - d. thinning out and corrective pruning
        - e. A bearing tree need very little pruning

E. Insects and diseases (Core: Chemicals and Problems)

    1. Insects
        - a. Scale
        - b. Plum curculis
        - c. Black cherry aphid
        - d. Cherry fruit fly (maggot)
        - e. Peach tree borer

    2. Diseases
        - a. Brown rot
        - b. Botrytis blossom blight
        - c. Leaf spot
        - d. Powdery mildew

    3. Control recommendations
        - a. Home garden
        - b. Commercial orchard

F. Harvest and marketing (Core: Business Management)

    1. Time to harvest - flavor and over-all color

    2. Harvesting
        - a. Hand and pick-your-own
        - b. Mechanical
            - (1) Fruit loosening chemicals

(2) Shakers

3. Grading

4. Marketing - nearly half the sweets and nearly all the tart cherries are processed

SUGGESTED ACTIVITIES:

1. Plan, plant and maintain, on school grounds, a tree fruit display orchard. (I-IV)

2. Visit pick-your-own, roadside market and large scale production orchards and discuss similarities and differences of each. (I-IV)

3. Send for nursery catalogs and practice selecting cultivars. (I-VI)

4. Demonstrate mixing, loading and applying pesticides and herbicides safely. Allow competent students to apply with supervision.

5. Show Bergwell filmstrip set on pesticide safety.

6. Identify and determine control for weeds on school grounds. (I-VI)

7. Train and enter a team in the State FFA Weeds Contest. (I-VI)

8. Demonstrate and encourage the safe cleaning of equipment, disposal of unused pesticide materials and containers, and the storage of chemicals. (I-VI)

9. Harvest, grade and display fruits from display orchard. (II-VI)

10. Train and enter a team in the State FFA Fruits and Vegetable Contest. (II)

11. Have students work up a "Food For America" program on how fruits are grown. Show to schools. (II-VI)

EVALUATION - UNIT 3

	Area of Evaluation	Suggested Method Written	 Performance
1.	List factors to consider in selecting a site for an orchard. (I)	X	
2.	List four advantages of dwarf trees. (I)	X	
3.	Name and describe two methods of dwarfing. (I)	X	
4.	Name and describe three dwarfing rootstocks used in apple culture. (II)	X	
5.	List and identify major recommended varieties for each of the following tree fruits: apple, pear, peach, nectarine, plum, sweet cherry, tart cherry. (II-VI)	X	X
6.	Plant tree fruits. (II-VI)		X
7.	List reasons for maintaining a permanent sod cover for tree row middles. (I)	X	
8.	List and describe two methods of determining the nutritional needs of an orchard. (I)	X	
9.	List five reasons for pruning fruit trees. (I)	X	
10.	Name and describe two methods of irrigation. (I)	X	
11.	Name, describe and discuss advantages and disadvantages of the various methods of weed control. (I)	X	
12.	Identify six common orchard weeds. (I)	X	X

	Area of Evaluation	Written	Performance
13.	Describe methods of controlling mice and deer in the orchard. (I)	X	
14.	Identify the various stages of development which pesticide applications follow. (I)	X	X
15.	List four reasons it is important to learn the techniques of budding and grafting fruit trees. (I)	X	
16.	Draw an orchard plan, including specific varieties [for any one and/or all of the following: apple, pear, peach, plum, nectarine, cherry]. (II-VI)		X
17.	Prune apple, pear, peach, nectarine, plum and cherry trees. (II-VI)		X
18.	List and discuss nutrients that are important in apple development. (II)	X	
19.	List the five benefits of fruit thinning and discuss the methods. (I)	X	
20.	Name the two fruits chemical thinning can be applied to. (II, III)	X	
21.	Identify the major diseases and insects of orchards and determine an appropriate, safe control for each species. (II-VI)		X
22.	Grade apple, pear, peach, nectarine, plum and cherry. (II-VI)		X
23.	Determine proper time to harvest apple, pear, peach, nectarine, plum and cherry. (II-VI)		X

	Area of Evaluation	Written	Performance
24.	List market outlets for apple, pear, peach, nectarine, plum and cherry. (II, VI)	X	
25.	Identify the major New Jersey varieties of apples. (I, II)		X
26.	Demonstrate the different types of grafting and budding techniques. (I)		X
27.	Discuss hardiness and compatibility in fruit tree selection procedure. (II-VI)	X	
28.	Outline the basic botany and terminology related to tree fruit production. (I)	X	
29.	Correctly determine the number of plants per acre required in an orchard. (I)	X	X
30.	Develop an appreciation of the opportunities for employment in pomolgy. (II-VI)	X	
31.	Identify and discuss chemical and mechanical safety in pomology. (II-VI)	X	

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UNIT

SMALL FRUIT CULTURE

PURPOSE

SPECIFIC OBJECTIVES

OUTLINE

- I. STRAWBERRIES
- II. GRAPE CULTURE
- III. BLUEBERRY CULTURE
- IV. CRANBERRY CULTURE
- V. BRAMBLE CULTURE

SUGGESTED ACTIVITIES

EVALUATION

REFERENCES

UNIT 2

SMALL FRUIT CULTURE

PURPOSE:

The purpose of this unit is to provide the student with the information and learning activities necessary to develop basic knowledge and skills in the field of small fruit production as it relates to horticulture.

SPECIFIC OBJECTIVES:

After completion of this unit, students will be able to:

1. List factors to consider in selecting a site for a strawberry planting.
2. Select appropriate strawberry cultivars for the areas.
3. Propagate strawberries by runners.
4. Properly prepare soil for planting strawberries.
5. Name and describe planting systems for a commercial strawberry operation and one for limited space.
6. List steps to follow in planting strawberries.
7. Explain the cultural practices of weed control, mulching and fertilizing as they relate to the care of strawberries.
8. Identify insect and disease damage of strawberry plants.
9. Determine the proper control of pest damage to strawberry crop.
10. Outline proper procedures for harvesting and marketing strawberries. List advantages and disadvantages of pick-your-own operation.
11. Select a planting site for a vineyard and give reasons for its selection.

12. Name at least three grape culivars.

13. Take hardwood cuttings of grapes.

14. List steps involved in preparing a site for a vineyard.

15. Plant a grape vine correctly.

16. Explain cultural practices of weed control, mulching and fertilizing as they apply to the care of grapes.

17. Construct, and train a grade vine to, a trellis using the Kniffins (long-cane) system.

18. Identify pest damage of grapes and determine the appropriate control for the damage. Outline proper procedure for harvesting and marketing grapes.

19. List the site and soil requirements for a blueberry planting.

20. Select appropriate blueberry cultivars for New Jersey.

21. Plant, mulch, fertilize, spray and prune blueberries.

22. Identify pest damage in blueberries and determine the safe and appropriate control for the damage. Outline proper procedure for harvesting and marketing blueberries.

23. List the site requirements for establishing a cranberry bog.

24. Describe the wet harvest method of harvesting cranberries.

25. List the factors to consider when selecting a site for a planting of bramble fruits.

26. Explain and/or demonstrate the planting procedure for any or all of the bramble fruits including proper spacing.

27. Outline a pruning program for any of the bramble fruits.

28. List organic disease controls for brambles.

UNIT OUTLINE:

I. Strawberry Culture

A. Industry overview

  1. State
  2. Local

B. Site and soil requirements (Core: Soil)
  1. Factors in locating a commercial planting
    a. Accessibility to markets - wholesale, auction, roadside or pick-your-own
    b. Transportation facilities
    c. Adequate labor supply
    d. Community interest
    e. Climate
  2. Factors in site selection
    a. Water
    b. Air drainage (frost)
    c. Slope
    d. Exposure
    e. Character of soil

C. Cultivars
  1. Varieties recommended for the area
  2. Verticillium Wilt and Red Stele resistant
  3. Types
    a. Early
    b. Mid-season
    c. Late
    d. Everbearing varieties

D. Propagation
  1. Commercially by runners
  2. Tissue culture

E. Preparation and Planting

1. Purchasing plants
    a. Buy from a reputable nursery
    b. Certified disease -, insect-, and virus-free
    c. Calculate number of plants needed (dependent on distance between rows and distance between plants in row)
2. Soil preparation
    a. Rid land of disease, nematodes and persistent weeds
        (1) Cultivate 1-2 years prior to planting (not with peas, tomatoes, potatoes or beets)
        (2) Fumigate (see ext. bulletin 417-A for up-to-date recommendations)
        (3) pH range of 5.5-6.5 lime or fertilize accordingly
3. Planting systems
    a. Matted row system (most common in New Jersey)
        (1) Plants set 18-24" apart in a row; rows 4-1/2-5 feet apart
        (2) Runners allowed to spread 14-16" in row
        (3) Simplest and least expensive
        (4) Must be careful of excessive runners and plant production
    b. Hill system
        (1) Double rows 12" apart with plants 10-12" apart in a row; 38-44" between double rows
        (2) No runners allowed to grow
        (3) Labor intensive even with use of garden or field tractor
        (4) High yields and good quality

- c. Spaced row system
    - (1) Plants set 18-24" apart in rows 42" apart
    - (2) Some runners allowed to grow and are spaced to fill in the rows
    - (3) Labor intensive and therefore expensive
- d. Pyramid and barrel planting for limited space

4. Planting
    - a. April to early May
    - b. Cultivate to eliminate weeds and establish a firm seed bed
    - c. Lay out rows according to planting system chosen
    - d. Keep roots moist while planting
    - e. Set plant at proper depth (too deep, plant smothers; too shallow, plant dries out)
    - f. Fan roots and prune if necessary
    - g. Pack soil around roots
    - h. Water immediately

F. Cultural practices

1. Weed control (Core: Chemicals)
    - a. hand weeding
    - b. Mechanical
    - c. Mulching
        - (1) Black plastic
        - (2) Natural (straw, saw dust, grass clippings, etc.)
        - (3) Also conserves moisture and controls fruit rot

        - d. Chemical (see ext. bulletin 417-A for recommendations)
    - 2. Irrigation (Core: Horticulture Practices)
        - a. Trickle or drip
        - b. Sprinkler (an advantage in areas where there is need for frost control)
        - c. Furrow
    - 3. Lime and fertilizer requirements
        - a. Applied at time of planting
        - b. Applied late summer or early fall to increase number of fruit buds in spring bearing plants
        - c. Just before blossoming in the fruiting season

G. Pest Control (Cores: Chemicals and Problems)

- 1. Insect pests
    - a. Grubs, root weevils
    - b. Strawberry weevils
    - c. Aphids, spittlebugs
    - d. Two-spotted spider mites
    - e. Leafrollers
    - f. Nematodes
- 2. Diseases - foliage, fruit and root
    - a. Common diseases: gray molds, leaf spots, red stele and verticillium wilt
    - b. Organic controls
        - (1) Resistant varieties
        - (2) Disease-free plants
        - (3) Practice good weed and insect controls
- 3. Control recommendations

- a. Home
- b. Commercial

H. Harvesting and marketing

1. Harvesting (Core: Horticulture Practices)
   - a. Hand picking (berry stem should be pinched off vine 1/2" in length so as not to break skin of berry)
   - b. Machine harvesting
   - c. Crates and carriers - 12 pint flat or fiberboard boxes used to market direct or ship
   - d. Cold storage - held at 32°F a maximum of ten days

2. Marketing
   - a. Hand pick for market
   - b. Pick-your-own
   - c. Frozen (1/2 of U.S. commercial crop used in manufacture products or dessert use)

II. Grape Culture

A. Overview of industry

1. Statewide
2. Local

B. Site requirements

1. Site (one that is a little higher than the surrounding area to allow air drainage during frosty nights and early mornings)

C. Soil requirements (Core: Soil)

1. Grows well in sandy loam, loam and loamy sand
2. Require well-drained soil
3. Should hold ample moisture

4. Too much clay, especially in subsoil, become waterlogged and are unsuitable

D. Cultivars (American-types are generally recommended)

1. Niagara (white) early season

2. Delaware (red) mid-season - high quality table grape; ships and stores well; makes good wine

3. Concord (blue) mid-season; highly productive; resistant to downy mildew; for juice, jelly and table use

4. Catawaba (red) late season; ships and stores very well; wine grape

5. Seedless grapes preferred by public - Interlaken, Himrod, Lakemont and Romulus

E. Propagation (Core: Horticulture Practices)

1. Cuttings (most common)

2. Layering

3. Grafting

4. Tissue culture

F. Preparation and planting

1. Nursery stock (first grade, 1-year old vines, certified free from viruses and root parasites with good root systems)

2. Planting times (early spring is best--March or April) but can be planted in October or November)

3. Preparing the ground (Core: Horticulture Practices)

   a. Start a year before planting

   b. Level the ground

   c. Install drainage tiles, if needed

   d. Grow a high fertility crop as corn or use herbicide to control persistent weeds

        e. Lime to pH 6.5 in fall

        f. Leave sod middles

    4. Care of stock before planting

        a. Upon arrival, open bundles and wet roots thoroughly

        b. If not planting immediately, "heel-in" plants

        c. Keep roots wet before planting by covering with wet burlap

    5. Ten feet between rows and eight feet between plants in the row

    6. Use contour planting on slopes, or arrange rows in the north/south direction on level ground

    7. Dig hole so roots can be spread and plant can be set one inch lower than it grew in the nursery (no fertilizer in the hole)

    8. Stake or start trellis

G. Cultural practices

1. Weed control (Core: Chemicals) - permanent mowed sod middles with a narrow strip of cultivation on either side of grape trunks

    a. Cultivate shallowy - 3-4" deep

    b. Grape hoe (pulls surface layers of weeds and soil from under trellis; Two weeks later, throws soil back under trellis

    c. Mechanical cultivation preferred over chemical - it aids in breaking up the life cycle of insects, such as the grape berry moth and root borer

2. Lime (Core: Soil)

    a. Usually not necessary to lime unless pH is below 5.5 or magnesium deficiency is apparent (use dolomite for the latter)

3. Fertilizer requirements

   a. Strawy manure (at rate of 10-12 tons per acre is best fertilizer for small scale operation)

   b. Commercial fertilizers

      (1) 5-10-5 or 5-10-10

      (2) One pound per plant per year for first 2 years; 1/2 applied in early March; 1/2 in May

      (3) Two pounds per plant in the spring before buds swell for producing vineyards

H. Pruning and support (Core: Horticulture Practices)

1. Trellis

   a. Most commonly a 2-wire trellis

   b. Posts supporting wire placed 14-18 feet apart

   c. Number 9 wire is used

2. Pruning grapes (see Appendix 2)

   a. Reasons for pruning

      (1) Fruit is borne on one-year wood

      (2) If not pruned enough, a vine will overproduce that year and be weakened

   b. "Cane" pruning

      (1) Recommended for the American grapes grown in the Northeastern United States

      (2) Long canes with 8 or more buds are retained

      (3) Long canes are retained to get the increased production from the buds beyond the 2 or 3 basal buds

   c. Prune when plant is dormant and temperatures are above freezing

- d. Pruning systems
    - (1) Kniffins (long-cane) system
    - (2) Geneva Double Curtain (short-cane) system
    - (3) Single Curtain system
    - (4) Hudson River system

I. Pest control (Cores: Chemical and Problems)

- 1. Insect pests
    - a. Flea beetle
    - b. Leaf hopper
    - c. Berry moth
    - d. Japanese beetle
- 2. Diseases
    - a. Black rot
    - b. Powdery mildew
    - c. Downy mildew
- 3. Control recommendations
    - a. Home
    - b. Commercial

J. Harvesting and marketing (Core: Business Management)

- 1. Stage of maturity (judging)
    - a. For jelly - (pick a little early to obtain clear, crystal-free jelly)
    - b. For table use - (pick when color and flavor are at the peak; before berries start to shatter from the bunch)
    - c. For juice - (allow to hang until fully mature)
    - d. For wine - (judged by the soluble solids/sugar ratio)

2. Hand picking and packing
    a. Removed by special shears or knife
    b. Handled by stem
    c. Better bunches are picked first and packed as Fancy or Number 1 grapes
    d. Imperfect bunches are picked later and packed as Number 2 grapes
    e. Poorer small bunches packed last for juice
3. Mechanical harvesting - for juice and wine
4. Marketing
    a. Taken to market the day they are picked
    b. Can be stored under controlled atmosphere for over two months

III. Blueberry Culture

A. Overview
    1. State - highbush - 7,300 acres in cultivation
    2. Local

B. Site and soil requirements (Core: Soil)
    1. Full sun
    2. Light, well-drained acid soils
    3. Good soil structure
        a. High organic matter content
    4. Cold requirement
    5. pH of 4.3 to 4.8

C. Cultivars
    1. "Earliblue" - early season - fruit is large, firm, light blue and excellent flavor - vigorous, upright bush

2. "Collins" - early-mid season - fruit is large, firm, light blue with very good flavor - vigorous, upright bush

3. "Blueray" - early-mid season - fruit is large light blue with medium scar, but resist cracking - productive

4. "Bluecrop" - mid season - fruit is large, firm, small scarred, good flavor and resists cracking; vigorous, upright bush; good producer

5. "Berkeley" - mid season - fruit is large, with excellent color, flavor and keeps well; vigorous, open and spreading bush

6. "Jersey" - late season - fruit is medium size, good color, fair flavor; vigorous, upright

7. "Coville" - late season - fruit is large, medium blue, highly aromatic, tart and of excellent dessert quality; vigorous, open spreading bush

8. "Elliot" - very late season - fruit is medium, light blue, firm and good dessert quality; upright

D. Propagation (Core: Horticulture Practices)

1. Hardwood cuttings (grown for one year after rooting and sold as two year plants)

2. Some softwood cuttings

E. Preparation and planting

1. Lime - if pH is lower than 4.3, add ground limestone

2. If pH is higher than 4.8, add fine ground sulphur or fertilize with ammonium sulfate to lower pH

3. Plow under humus or green manure

4. Spring planting (although can be done in the fall)

5. Three feet to four feet between plants in rows nine feet to ten feet apart

6. Planting

a. Keep roots from drying out

b. Holes large enough for roots to fit

c. Firm soil around routs

d. Water

e. Cut back 1/3 to 1/2

F. Cultural practices

1. Weed control (Cores: Chemicals and Problems

a. Shallow cultivation

b. Mulching - straw, sawdust, wood chips, etc.

(1) Helps conserve moisture as well as controlling weeds and erosion

(2) Fine material (sawdust) 2-3" thick

(3) Coarse, open material 4-5" thick

(4) Nitrogen fertilizer must be applied with organic mulches

c. Chemical control recommendations

(1) Home owner

(2) Commercial

2. Irrigation (Horticulture Practices)

a. 1-2 acre-inches, 10 days apart, during picking season

b. Solid-set irrigation

c. Trickle irrigation

3. Fertilizing

a. Home owner (to maintain acid soil)

(1) Spread powdered sulfur at 1-1/2 pounds per 100 square feet

(2) Water each plant with one teaspoonful of aluminum sulfate

per gallon of water

(3) Spread one tablespoon aluminum sulfate around each plant monthly during growing season

(4) Organic method (apply cottonseed meal and/or sawdust)

b. Commercial

(1) First application for bearing bushes - at beginning of bloom (around April 20)

(2) Second application to help the developing crop as well as formation of fruit buds on new shoots (around June 1)

(3) 10-10-10 fertilizer

(4) Quantity to apply - 125-450 pounds per acre, per application depending on age of plantation, vigor of plants, soil characteristics and fruit production (see New Jersey extension bulletin 432)

4. Pruning (Core: Horticulture Practices)

a. Blueberry bears fruit on wood of the previous seasons growth

b. Very little pruning is needed until the third year after planting

c. Every year after the third

(1) Center kept open by removing old and weak wood

(2) Low hanging branches removed

(3) Small, slender branches cut off at ground level leaving only strong vigorous shoots and branches

5. Pollination

a. Studies indicate that cross-pollination results in higher seed count, larger berries and earlier ripening

- b. Commercial blueberry growers rent colonies of honeybees to insure adequate blossom pollination

G. Pest control (Cores: Chemicals and Problems)

- 1. Diseases - ID and control
  - a. Stunt virus
  - b. Mummy berry
  - c. Red ringspot virus
  - d. Anthracnose
  - e. Botrytis
- 2. Insects - ID and control
  - a. Scale
  - b. Plum curculio
  - c. Fruit worm
  - d. Leaf hoppers
  - e. Blueberry maggot
- 3. Pesticide recommendations
  - a. Home
  - b. Commercial

H. Harvesting and marketing (Core: Business Management)

- 1. Beginning of harvest around middle of June for a period of 6-8 weeks
- 2. Early, large berries harvested by hand, later, smaller berries by machine (mostly used for processing)
- 3. Packaged in polyethylene wrapped boxes to increase attractiveness and holding period
- 4. Most cultivated blueberries are marketed fresh with increasing quantities being frozen and processed

IV. Cranberry Culture

- A. Overview
  - 1. National
  - 2. New Jersey
    - a. Highly specialized
    - b. Limited to acid bogs or swamp areas (therefore not suited for the home gardener)
- B. Site and soil requirements (Core: Soil) (factors to be considered before developing a cranberry bog)
  - 1. Cost per acre is high to clear, level and ditch the bog; install water systems, and plant.
  - 2. Three years of upkeep before the crop comes into bearing
  - 3. Alkaline peat and ordinary soil is not suitable
  - 4. A large supply of water is necessary
  - 5. Site must provide for drainage to 18"
  - 6. A large supply of readily available, clean sand is needed
- C. Cultivars
  - 1. "Early Black" - standard - small berry, blackish red, harvest first two weeks of September
  - 2. "Howes" - standard late variety - larger, oblong, medium red berry; ripens mid to late September
- D. Preparation and planting
  - 1. Clear field of trees and brush
  - 2. Cut and turn turf over, burn roots of all weeds and obnoxious plants
  - 3. Construct ditches around and through field
  - 4. Grade field to facilitate quick flooding

    and drainage

4.
5. Construction of dams for sectional flooding
6. Construct flood gates and install pumping equipment
7. Cover the field with 3-4" of white coarse sand
8. Plant cuttings (disease-free!) early spring a foot apart both ways
9. Flood bog 1-2" after planting

E. Cultural practices (Core: Horticulture Practices)

1. Special attention to weeding first three years
2. Short floodings in spring and fall to protect against frosts (or use sprinklers)
3. Flood bog to cover vines when ground freezes in the fall
4. Flood to control insects
5. Irrigate during droughts
6. No fertilizer is necessary unless growth is poor
    a. 8-8-8 fertilizer
    b. 150 pounds in May and 150 pounds around August 15
7. Pruning (excessive runners, after harvest)

F. Pest Control (Cores: Chemicals and Problems)

1. Diseases - early rot and false blossom
2. Insects
    a. Cranberry fruit worm
    b. Black-headed fireworm
    c. blunt-nose leaf hopper
    d. root grub

e. gypsy moth

f. girdler

3. Control recommendations - commercial

G. Harvest

1. Mechanical pickers

2. Wet harvest

V. Bramble Culture (raspberry and blackberry)

A. Overview - grown mostly for Pick-Your-Own operations

B. Raspberry

1. Three types

a. Red - erect canes and propagated by suckers

b. Black - arched canes and propagated by tips

c. Purple - red/black hybrid cross same growth habit as black

2. Only red cultivars are grown commercially

3. Site (Core: Soil)

a. Deep, well drained soil

b. Northern slope preferred (cool, protected from sun)

c. Not near wild brambles which could transmit disease

d. 1,000 feet between red and black raspberry plantings

e. pH 6-6.5

4. Planting (Horticulture Practices)

a. Early in spring

b. Do not follow potatoes, tomatoes or eggplant

c. Black raspberries (generally grown in hills - 30" apart in rows 8-9 feet apart)

d. Red raspberries (20-40" apart in rows, 8-9 feet apart - set 2" deeper than they were in nursery

e. Roots should be kept moist during planting

f. Cut tops back to 6" before setting plants

5. Cultivars

   a. Red (Newburgh, September, Hilton, Heritage, Taylor, Latham, Milton

   b. Black (Allen, Bristol, Dundee, Huron, Jewel, Lowden

   c. Purple (Clyde, Brandywine)

6. Cultural practices

   a. 40-80 pounds of actual nitrogen per acre is required

      (1) In late March - 400 pounds 10-10-10

      (2) May or June - 30 pounds of nitrogen

   b. Irrigation may be needed in dry periods

   c. Pruning - supporting structures are recommended for brambles in the home garden; commercial plantings, with proper pruning, can be maintained without

      (1) Red raspberries - old fruiting, damaged and weak canes removed in dormant season; thin out new canes leaving 6-7 strong ones per row foot; these are topped at 40-48" in spring.

      (2) Fall-bearing red raspberries - canes mowed off 2-3 inches from ground, late fall-early spring; this eliminates trellis support, summer pruning and winter injury; and decreases disease and insect problems

(3) Black and purple raspberries - new canes topped in June, laterals pruned back in fall or early spring

C. Blackberry

1. Two types - erect and trailing

2. Water and soil requirements similar to raspberry

3. Plant early spring, 2-3 feet apart in rows 9-10 feet apart

4. Cultivars

a. Erect (Darrow)

b. Trailing (Thornfree, Smoothstem, Dirksen and Black Satin)

5. Pruning

a. Erect (topped in summer at 4 feet laterals pruned to 24" the following spring)

b. Trailing

(1) New canes grow along on ground

(2) Tie to trellis for support

(3) Not hardy, so cut from trellis and mulched in the winter

(4) After fruiting old canes removed

(5) Thin to 8 strong canes and tie to trellis next spring

6. Harvesting and marketing generally Pick-Your-Own
7. Harvest and marketing generally Pick-Your-Own

D. Pest control for brambles

  1. Diseases (Cores: Chemicals and Problems)

      a. Anthrachnose

      b. Spur blight

      c. Crown gall

      d. Leaf curl

      e. Mosaic

      f. Streak

      g. Tomato ringspot

  2. Disease Control

      a. Plant disease-free stock

      b. Keep plants growing vigorously

      c. Remove old and/or diseased plantings

      d. Remove all old fruiting and dead canes immediately

  3. Insects

      a. Spider mite

      b. Tree cricket

      c. Crown borer

      d. Raspberry saw fly

      e. Rose chafer

      f. Fruit worm

  4. Pesticide safety

  5. Control recommendations

      a. Home

      b. Commercial

SUGGESTED ACTIVITIES:

1. Plan and plant a school strawberry plot. (I)

2. Plan, plant and maintain, on school grounds, a small fruit display garden containing several varieties of grapes, blueberries, raspberries and blackberries. (I, II, III, V)

3. Encourage students without SOE projects to propagate from school plants, plant and maintain their own strawberry, blueberry and/or bramble fruit planting. Encourage students to expand into a small production project. (I, III, V)

4. Visit "Pick-Your-Own" fruit production operation. (I, III, V)

5. Propagate strawberry, grape, blueberry and bramble fruit (from school plants) to distribute to students without SOE projects. (I, II, III, V)

6. Send for nursery catalogs and practice selecting plants. (I, II, III, V)

7. Show Bergwell filmstrip set on pesticide safety. (I, II, III, IV, V)

8. Demonstrate mixing, loading and applying pesticides safely and allow competent students to apply with supervision. (I, II, III, IV, V)

9. Have all students keep a record of pesticide usage. (I, II, III, IV, V)

10. Demonstrate and encourage the safe cleaning of equipment, disposal of unused pesticide materials and containers, and the safe storage of chemicals. (I, II, III, IV, V)

11. Set up a pesticide safety demonstration for community during open house. (I, II, III, IV, V)

12. Show filmstrip on "Grape Vineyard Establishment and Maintenance." (II)

13. Have students work up a Food for America program on "how fruits are grown" - show to schools. (I, II, III, IV, V)

14. Harvest, grade and display fruits from display garden. (I, II, III, IV, V)

15. Construct a trellis for grapes and raspberries in school display garden. (II, V)

16. Visit cranberry operation at harvest time. (IV)

17. Have students visit a local vineyard to see as a business from planting to harvesting and wine production. (II)

		Suggested Method	
	Area of Evaluation	**Written**	**Performance**
1.	List factors to consider in selecting a site for a strawberry planting. (I)	X	
2.	Select appropriate strawberry cultivars for the areas. (I)		X
3.	Propagate strawberries by runners. (I)		X
4.	Properly prepare soil for planting strawberries. (I)		X
5.	Name and describe planting systems for a commercial strawberry operation and one for limited space. (I)	X	
6.	List steps to follow in planting strawberries. (I)	X	X
7.	Explain the cultural practices of weed control, mulching and fertilizing as they relate to the care of strawberries. (I)	X	X
8.	Identify insect and disease damage of strawberry plants. (I)		X
9.	Determine the proper control of (pest) (insect and disease) damage to strawberry crop. (I)		X
10.	Outline proper procedures for harvesting and marketing strawberries. List advantages and disadvantages of pick-your-own operation. (I)		X
11.	Select a planting site for a vineyard and give reasons for its selection. (I)	X	
12.	Name at least three grape culivars. (II)	X	
13.	Take hardwood cuttings of grapes. (II)		X

	Area of Evaluation	Written	Performance
14.	List steps involved in preparing a site for a vineyard. (II)	X	
15.	Plant a grape vine correctly. (II)		X
16.	Explain cultural practices of weed control, mulching and fertilizing as they apply to the care of grapes. (II)	X	X
17.	Construct, and train a grade vine to, a trellis using the Kniffins (long-cane) system. (II)	X	X
18.	Identify pest damage of grapes and determine the appropriate control for the damage. Outline proper procedure for harvesting and marketing grapes. (II)		X
19.	List the site and soil requirements for a blueberry planting. (III)	X	
20.	Select appropriate blueberry cultivars for New Jersey. (III)		X
21.	Plant, mulch, fertilize, spray and prune blueberries. (III)		X
22.	Identify pest damage in blueberries and determine the safe and appropriate control for the damage. Outline proper procedure for harvesting and marketing blueberries. (III)		X
23.	List the site requirements for establishing a cranberry bog. (IV)	X	
24.	Describe the wet harvest method of harvesting cranberries. (IV)	X	

Area of Evaluation	Written	Performance
25. List the factors to consider when selecting a site for a planting of bramble fruits. (V)	X	
26. Explain and/or demonstrate the planting procedure for any or all of the bramble fruits (including proper spacing). (V)	X	X
27. Outline a pruning program for any of the bramble fruits. (V)	X	
28. List organic disease controls for brambles. (V)	X	

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Reiley, H. Edward & Shry, Carroll L. *Introductory Horticulture.* Albany, NY: Delmar Publishers, 1979.

Scheer, A. & Juergenson, E. M. *Approved Practices in Fruit and Vine Production.* Danville, IL: Interstate Publishers.

AUDIO VISUALS

Cranberrying, filmstrip or video cassette, Hawkhill Associates, Inc., 125 E. Gillman Street, Madison, WI 53703

Grape Vineyard Establishment and Maintenance. Sound filmstrip. Vocational Education Production Catalog (1-230-230A). (Summary: introduces students to the major steps necessary to establish and maintain a productive vineyard.)

Pesticides: Safe Handling and Use. Six color filmstrips. Bergwall, 260-V4. (Summary: reviews everything from definitions and laws to cleaning and disposal of pesticides.)

OTHER

Approved Practices for Small Fruits. Manual. Ohio Curriculum Materials Catalog. Pennsylvania Agricultural Education, 1978.

Bush Fruits in the Home Garden for New Jersey. Extension bulletin 298-F. New Brunswick, NJ: Rutgers University

Commercial Blueberry Growing. Farmers bulletin #2254. Washington, DC. USDA.

Commercial Strawberry Production in New Jersey. Extension bulletin 417-A. New Brunswick, NJ: Rutgers University

Fruit Adapted for Home Garden Growing. Extension leaflet 539-B. New Brunswick, NJ: Rutgers University

Grape Growing in New Jersey. Extension bulletin 330-C.

New Brunswick, NJ: Rutgers University.

Grape Spray Schedule for New Jersey Home Gardeners. Extension leaflet 514-A. New Brunswick, NJ: Rutgers University.

Passport to the World of Blueberries. Booklet. North American Blueberry Council, PO Box 166, Marmora, NJ 08223.

Raspberry and Blackberry Culture in New Jersey. Extension bulletin 429. New Brunswick, NJ: Rutgers University.

Small Fruit Production Manual. Extension bulletin 432. New Brunswick, NJ: Rutgers University.

Strawberries in the Home Garden. Extension leaflet 352-D. New Brunswick, NJ: Rutgers University.

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